

FUNDAMENTAL HYPOTHESES
WITH
DEDUCTIONS

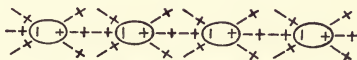
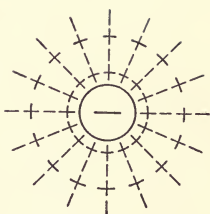
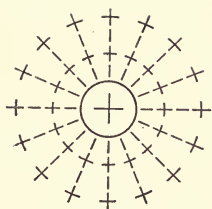
CONCEPTS OF
EINSTEIN
AMENDED

DR. ADAM



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THE SOLAR SYSTEM

AN ASTRONOMICAL UNIT

A Work of Deduction Based on a Fundamental
Hypothesis

BY

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Author of

"Electricity, the Chemistry of Ether." "Concepts of Electric
Phenomena of Planetary Systems." "From Ether to the Physio-
logic Unit." "The Physiologic Unit." "Theoretical Consid-
eration of X-Ray Energy." "Radioactivity." "Earth-
quakes, an Astronomical Question." "Nation-
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"Medicinal Vibration." "Cataphoresis."
"Origin and Character of X-Rays."
"Hysteria," Etc., Etc.

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DEDICATED
TO
THE MEMORY
OF
THE GREAT NEWTON

WHO, FROM AN INTUITIONAL PERCEPTION OF
TRUTH, STEADFASTLY ADHERED TO THE CORPUSCULAR
THEORY OF LIGHT.

NOTHING EXISTS, EITHER ACTUALLY OR POTENTIALLY,
BUT WHAT A MIND IS EVOLVED TO CONCEIVE
AND TO COMPREHEND.

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1921

PREFACE.

This work is an extension of former publications—"Concepts of Electric Phenomena of Planetary Systems," and "Electricity the Chemistry of Ether." The latter, a book of 600 pages, was destroyed by the San Francisco fire of 1906; and the former, a smaller book, was partially destroyed by the same fire. The larger work was based on the interpretation of facts of Electricity, Chemistry, Physics and Physiology, as viewed from the standpoint of the Hypothesis; the smaller was the application of the hypothesis to Astronomical facts. After the California earthquake of 1906 there was issued, in pamphlet form, "Earthquakes, an Astronomical Question." This, with slight alteration, is reproduced in the present publication.

It was intended to publish the astronomical deductions as the fourth part of a larger volume, the first part of which is an elaboration of the immediate deductions from the general hypothesis, which were formulated as a platform of secondary principles, from which to draw further deductions. The second part of the larger work is devoted to Heat and Light; and the third part to Electricity, Roentgen Rays, Photo-electric Phenomena, etc. Hence it is clear that in the present small volume no large amount of space can be devoted either to the hypothesis or to the direct deductions from the hypothesis. For instance the chapter dealing with the physical character of ether is simply a synopsis of the original; and the same characterization applies to that on Heat and Light. The publication of the larger work, now in manuscript, will follow.

PREFACE.

The following works have chiefly supplied the facts essential to the deductions recorded: General Astronomy, by Young; The Evolution of Worlds, by Lowell; How to Know the Starry Heavens, by Edward Irving; Physical Optics, by Wood; and Geology, by Le Conte.

Through the courtesies of Dorothea Isaac-Roberts, I have been much encouraged in the pursuit of my work and have had the privilege of copying photographs by the late Dr. Roberts.

I am greatly indebted to Alice Marie O'Neill for drawings illustrating my conceptions of the Solar System.

To my wife, Dr. Alice Douglas Adam, I have to express my very great obligation for encouragement and material assistance rendered in the preparation of this work.

San Francisco, California, May, 1915.

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INTRODUCTION.

Since 1897 the author has labored in developing an hypothesis which he considers elementary to the laws of force. An intuitional appreciation of a truth at the beginning became a firm conviction by the interpretation of facts collated from many channels. The hypothesis was primarily stated as follows: "Electricity is the Chemistry of the Ether." The conception is more fully expressed in the following formulae: The Ether is the Simplest form of Matter, is Molecular, and Electricity, in the broadest sense of the term, is its Chemistry. This is a work of deduction based upon the hypothesis.

The term *Electricity* is here used as being analogous to the term *Chemistry*; or electricity may be considered a branch of chemistry as dealing with the chemical analysis and chemical synthesis of Ether Matter. More fully and conversely the hypothesis may be stated thus: That the matter of the Universe is fundamentally composed of two kinds, one the positive, cation, or concentrative; the other the negative, anion, or diffusive; that these exist in their pure or uncombined state respectively as positive and negative electric matter (electricity); and that positive and negative electric matter chemically combine and mutually neutralize, unit quantity with unit quantity, as the simplest physical form of matter, the Ether. The ether molecule is thus composed of two atoms, one purely positive and one purely negative matter, which under specific conditions of strain dissociate into electric matter. In describing an ideal elementary matter (Chapter I) the concordant conditions of differentiated matter are fully considered.

It appears that much concern has been bestowed on inductive methods of reasoning, the premises of which have had too limited fields, and hence failures to reach general principles have followed. The investigation of particular phenomena leads to unsafe conclusions, except it embraces a sphere of action of independent unity. According to the deductions of this work, only one such sphere is available—the solar system as a cosmic unit.

A phenomenon or group of phenomena pertaining to the terrestrial sphere cannot be fully understood unless the relation of the Earth to the forces of the solar system is fully considered. The relation of local phenomena to general forces is well indicated by the fact that the organic cell at present is not developed, and could not be maintained, in any part of our star-space excepting an area approximately bounded by the orbits of Venus and Mars.

It is also apparent that deduction from an hypothesis which is not fundamental may be misleading. On the other hand an hypothetical truth fundamental to the physical facts or phenomena of a cosmic unit, and hence to the universe, must be in the position of an arbiter of all conclusions, and must place induction in the position of its hand-maid.

Scientists have been yearning for a key to a grand generalization. They have expected it to be revealed by a group of facts uncovered by experimentation, whereas its formula must necessarily spring into being as a simple creation of intuitional thought or imaginative effort, for it must deal with entities beyond observational research. Hence the elaboration of the hypothesis must depend on the power to draw a mental picture of conditions beyond perceptive investigation, based on

the interpretation of all relative facts, or on the construction of analogies with observed conditions. A general hypothesis will demand that all elementary facts be made witnesses to its correctness; and that by virtue of its authority all particular theories must before acceptance receive certificates of good standing. All other theories will thus be transformed into deductions.

The method employed has been to draw immediate conclusions from the hypothesis on which to build a platform of secondary principles. In general the conclusions are therefore interpretations of relative facts on the basis of those principles. With regard to this work it is simply claimed that there has been priorly formulated a basic conception capable of generalization. The deductions are subject to correction without invalidating this claim. There has been constant "possession" and constant "work." A theory recorded without development work is as the squatting of land whose value increases through extraneous efforts. Such guesses are numerous, and sometimes brilliant, but proprietorship should only be awarded to those who expend energy and time in proving the worth of their conceptions. To the great army of workers engaged in uncovering facts too much credit cannot be accorded, for facts are the pillars on which a generalization must rest.

In a work of this size many issues appear which cannot be followed. For instance it may be denied that positive electricity is concentrative. This question has been considered and no relative fact has been uncovered but which is fully explainable on the basis of the hypothesis.

Deductions give no support to the kinetic theory of matter as presently accepted. This theory is foun-

dationless, except as applied to predominating negative or anion conditions. Instead deduction uncovers a molecular vibration consisting of two phases, polarization and depolarization, as indicated in the frontispiece, and finds this vibration elementary to allied phenomena as crystallization, magnetization, muscularization, neuralization, cerebation, and to the initiatory energy of light. More important as related to the subject matter of this volume is the definition of heat, which is in the nature of a radiation-pressure and somewhat analogous to blood pressure. It may be likened to the pressure of water at the outlet of a lake at the opposite side of which matter is added. Full discussion of those subjects is made elsewhere.

Deductions from this hypothesis lead to some remarkable conclusions, a few of which are as follow:

The Ether is the ultimate equilibration of forces under the law that all forces react with an intensity inverse as the square of distance.

The cathode particle is indivisible by existing forces.

An anode particle of the exact size of the cathode particle is an impossibility under like pressure.

The reaction between positive and negative forces, as a strain to neutralize at minimum distance, is the great diffusive agency of positive matter.

Positive and negative matter in ether molecules, in ponderable molecules, in planetary bodies, and in solar systems, tend to the same relative arrangement.

The Sun is a growing body and is the dominating causal factor in the evolutionary changes of the planets.

An astonishing conception of kinetic energy is evolved: There ensues from the fundamental conditions of matter as delineated a perpetual motion within each Cosmic Unit, which is commensurate with an

everlastingly unequibrated and unequilibratable portion of force—each cosmic unit intrinsically possesses an all-sufficiency for its own perpetual cyclic evolvment.

There is evolved an important concept of the quantitative relation of all matter and all force to all space.

Astronomy is the basic science: We cannot fully understand the properties and activities of the organic cell unless the essential conditions of its production, maintenance and disappearance within the solar system are comprehended.

The evolutionary stages of planets are indicated in a measure by the geological periods of the Earth.

The evolutionary as well as the time ages of planets are in direct proportion to their proximity to the Sun, their dimensions in this relation being of slight importance.

Sun-ward streams of energy must emanate from the poles of the planets, probably manifesting as aurora.

The notation is made with extreme gratification that deductions from this hypothesis in the main accord with the corpuscular theory of light. We find that light is corpuscular in every crisis of its course, although incidently wave-motion characterizes the propagation of the corpuscle.

Wireless telegraphy is easily conceived when the properties of the Ether are understood.

CHAPTER I.

A Creation.

“In the beginning God created the heavens and the earth.” Assuming a creation we proceed to formulate a conception of the essential material to be created and the mode of procedure. The universe being infinite and our minds finite it is necessary that we deal with a limited sphere of action, which must have the qualification of a celestial or spacial unit. Hence we will assume that the Creator first plots the Infinite or Cosmic Space. In the allotment the portion awarded the Solar System is demarcated by a line midway between it and adjoining systems. We will designate this the *star-space* of the Solar System. Based upon a prescience as to the results the Creator estimates the quantity of material requisite for the cosmic unit. This estimate is based on the essential and specific *quantitative relation of all matter and all force to all space*. He places within the unit plot equal and determinate quantities of positive and negative electric matter (electricity); He implants in the positive electric matter, as an inherent property, the principle *concentrativeness*; in the negative electric matter, as an inherent property, the principle *diffusibility*; and also imparts to both a *strain to mutually neutralize at minimum distance and by maximum contact*. Furthermore He implants in matter the property of *transductivity** whereby the concen-

* Obviously this property differs from those pertaining to light transmission and electric conduction which are neither fundamental nor general. It is, however,

trative and diffusive forces are inductively passed to points of mutual neutralization. The Creator, then considering His physical work finished, stands aside. The electricity—the forces as indicated—does the rest.

If we consider the ideal masses as ponderable or mixed matter then a similar evolvment of a sun and planets would obtain, the essentials being that positive and negative matter be equally represented, and quantitatively conforming to the relation of all matter and all force to all space. Matter having the properties assigned, in any physical form or forms, injected promiscuously into a star-space would evolve by its own forces into a cycle of energy of which a sun and planets would constitute a phase. It is preferable that the ideal masses be unmixed, simple, or purely elementary, that is to say electric matter.

We will suppose that the two masses of electric matter are placed apart many millions of miles, the space separating them being a vacuum (not even ether being present). How would they act? The positive mass would draw itself into a complete sphere, each constituent portion attracting all adjoining portions. On the other hand, the negative mass would attenuate into an extreme state of diffusibility, each constituent portion repelling all adjoining portions. The positive matter would concentrate into a motionless mass. The negative matter would diffuse into a mass of vibrating units, each particle repelling adjoining particles until contact is broken, when it would be repelled by proximate particles. By intrinsic force negative matter would

the same in principle as electric induction. In this respect electricity differentiates as an intensive force and may rupture the medium.

infinitely divide but would reach an equilibrium as regards space. It is evident that the action of the negative electric matter would bring it in contact with the mass of the positive, with the result that neutralization would occur.

As the positive and the negative electric matter seek neutralization at minimum distance and by maximum contact, it will be apparent that the mixed masses will divide and redivide until each minimum quantity of positive electric matter is in contact with an equal quantity of negative electric matter. Further, as the properties of positive electric matter are concentrative and those of negative are diffusive, the minimum quantity of the positive will assume a spherical form and will become central to a film of the negative which will be circumferential. This form more than any other satisfies the strain to neutralize by maximum contact, and at minimum distance. Thus a molecular substance is formed which fills space to the extent of globular capacity and whose molecular dimensions bear the impress of the *relation of all matter and all force to all space*. This substance we call the Ether. Fig. 1 indicates the form of ether molecules.

Let us consider an ideal condition of the ether without pressure whose molecules are spherical without distortion, and as far as possible in equilibrium, occupying space to the extent of its spherical entities. Under this condition there is no attraction between positive atoms nor repulsion between negative atoms. Within the molecular quantity a complete neutralization obtains under the law of distance. There still remains the strain on the part of positive and negative matter to neutralize by greater contact and at less distance, and the material of the molecules strains to a more tenuous

division. The strain to subdivide constitutes the energy of the ideal condition, and the subdivision would occur indefinitely unless the strain is equilibrated by pressure or by other force.

MATTER AND SPACE.

Now the evidence of the phenomena of partial vacua sustain the conception that the relation of all matter to all space is such that matter under extreme tenuity is under a pressure which is or approximates the minimum pressure of the universe. Hence the relation of all matter and all force to all space is not the relation in the above ideal condition, but a relation which gives this minimum pressure in a maximum tenuity as in ether matter, and a certain maximum pressure coincident with a maximum condensation as reached in the ponderable state. That is to say there is more matter in a star space than a universal ether matter, as in the above ideal condition, would afford. Therefore, we must conceive that a universal ether without ponderable matter, but capable of evolving ponderable conditions, would be an ether under pressure by virtue of its relationship to space, and by virtue of its molecular globular form. Such a pressure would not necessarily obliterate the intermolecular spaces of ether matter, but simply distort the molecular form. This ether matter would have, as already indicated, potential forces as follow: (1) Attraction between adjacent positive units; (2) repulsion between adjacent negative units; and (3) a strain to neutralize at minimum distance and with maximum contact between adjacent positive and negative units. Repulsion between negatives would be balanced by the pressure under the relation of matter to space. The neutralizing strain would be balanced by

the pressure supported by the concentrativeness of positive matter. The neutralizing strain is a diffusive agency but would reach its maximum effect when the circumferential negative film becomes so attenuated as to allow contact between two positive atoms in vicinity and under pressure. Under such conditions synthetic reactions occur between positive atoms thus initiating the first step towards mass formation. Attraction between positive units in a universal ether under pressure will furnish a kinetic force.

The quantitative relation of matter to space is of equal importance to the differential character of the elementary properties of matter. The reactions of force are modified by the modification of such relation. We may conceive of an impenetrable inert matter filling space, without interstices, an addition to this relative quantity, even under pressure, being impossible. As according to the author's conceptions and deductions intermolecular empty spaces exist in ether matter (the only empty spaces in the universe), he concludes that the quantitative relation of matter to space is not the relation of an inert matter as above conceived, but that of a less relative quantity—a quantity which allows ether molecules to assume the globular form by virtue of their intrinsic forces, although in a degree distorted by the pressure resulting from such spacial relations, nevertheless admitting of empty interspaces.

Thus the quantity of matter within a star-space or celestial unit-space must have a specific relation to the extent of the space, and this relation must be infinitely uniform, varying only as regards fractions of the unit—the minimum pressure of the matter of a star-space is the infinite minimum. Pertinent to this it will be observed that two of the three basic properties of

matter are diffusive in character, hence matter diffuses until the property of concentrativeness is supported (or diffusion is arrested) by pressure dependent on its spacial relation. The quantitative relation of matter to space is a factor in determining the quantity of solid matter in the solar system. It must, however, be borne in mind that the quantity of matter within a star-space of constant dimensions might vary within certain limitations, and yet matter by its properties would so adjust itself as to produce the phenomena of a solar system, simply by altering the quantitative relation between ponderable and ether matter, always remembering that such relation must indicate a universal relation.

MATTER AND MOTION.

Here we wish to emphasize, as a corollary to the general hypothesis, that the matter of a star-space, possessing the four fundamental properties as previously defined, and having a certain pressural relation to space as previously indicated, will have, perpetually, throughout changing physical conditions, a proportional quantity in motion, depending upon a relative amount of unequilibrated force. This unequilibrated force constitutes the kinetic energy of the star system, which, as hereafter shown, will principally manifest in cyclic forms.

Furthermore, it is indicated that, by a play between the fundamental properties of matter under the relation of matter to space, a limitation to the division of matter obtains in definite unchanging minimum atomic and molecular quantities of ether matter, and, as will be afterwards shown, in ponderable atomic and ionic or molecular ultimates; and also that there is established

a definite quantitative relation between ponderable and ether matter.

ANODE AND CATHODE PARTICLES.

The immediate result of the reactions mentioned as occurring in a universal ether under pressure must be the formation of ponderable particles, each having the value of two positive atoms of ether and one negative atom of ether. This gives the particle a free force equal to one positive atom of ether, which neutralizes inductively by polarizing the ether not participating in the reactions. These we will designate *cathode particles* (Fig. 2).

Coincident with the formation of cathode particles counterparts are formed, which we will call *anode particles*. The formative process of these is initiated by a nascent repulsion between two negative ether atoms, one becoming a constituent of a cathode particle and the other being repelled. It is obvious that matter thus arranges itself into a simple, imponderable or ether form; and into a more complex form generally known as ponderable matter. The ether form is insensible to gravitational or repelling forces by virtue of its positive and negative atoms neutralizing by maximum contact and at minimum distance, according to the law that forces react with an intensity inversely as the square of distance, subject to the relation of all matter and all force to all space. By the same law complex matter is subject to gravitational and repelling forces.

The complex form of matter has the two ultimates, the anode and cathode particles, which can be differentiated thus: Cathode particles, possessing positive free forces, seek the cathode of an electrolyte, are in general concentrative and form solid masses by virtue

of their inherent property; and in the construction of molecules, masses, or systems, when free from extrinsic influence, they assume central positions. Anode particles, possessing negative free forces, seek the anode of an electrolyte, are in general diffusive, and form gaseous masses by virtue of their inherent property; and in the formation of molecules, masses, or systems, when free from extrinsic influences, they assume circumferential positions. The cathode particle or mass is related to the ether molecule as 3 to 2, or perhaps as 6 to 2. The anode particle or mass has been estimated to be related to the cathode particle as 1000 to 1. Anode and cathode particles are the resultants of a residual gas under extreme decrement of pressure, and are the ponderable elements which, when electrified, become the anode and cathode rays of a Crookes or partial vacuum tube. The formative processes of these particles is important to consider. The cathode particle is formed by the inherent forces of its constituents. The anode particle is an aggregation driven from, and enclosed by, the induction fields of cathode particles, its own forces being dissolving. Its quantity is a compromise between its own dissociating forces and the insulating properties of surrounding fields. The anode particle is neutralized through, and herded by, induction fields. The interpretation of the facts of electrified partial vacua as expressed by the author in a former work, is in accordance with the above conclusions. The conclusions are also in accordance with the general facts of chemical dissociation. A synthetic reaction in a universal ether under a minimum pressure would not produce a neutral substance composed of two positive and two negative atoms, but substances such as cathode and anode particles with free molecular

forces. The law governing the relation of pressure and force may be formulated thus: Ponderable molecules divide and redivide under decrease of pressure with increased molecular free forces until the minimum molecular quantities of ponderable matter are reached. The ideal universal ether under pressure being in a subnormal state of molecular formation would adjust itself to meet the conditions of minimum pressure. A further adjustment would depend upon the degree of pressure. Matter thus arranges itself into positive and negative units which radiate force, and into a neutral substance (ether) which acts as a medium of radiation.

An extraordinary correspondence of theory and fact, occurs in the case of anode and cathode particles. Theoretically we construct the cathode particle of one negative and two positive ether atoms. The counterpart of this would be one positive and two negative ultimates for an anode particle. But it is clear that a construction of one concentrative ultimate and two diffusive ultimates would not hold. The facts show that the anode particle can only exist with a mass 1000 times that of the cathode particle—under minimum pressure.

It must be clearly borne in mind that we are considering the anode and cathode particles as ponderable elements, and unelectrified. The ponderable cathode particle seeks the cathode of a Crookes tube, is negatively electrified, and becomes the element of cathode rays. The anode particle seeks the anode of the tube, is positively electrified, and is the element of anode rays.

The cathode particle consisting of two positive ultimates of concentrative force and one negative ultimate of diffusive force is theoretically indivisible by the forces of the universe. The forces of matter cannot be

sufficiently intensified to dissociate it. The author has considered the chemical, electrical, and physical forces of dissociation and has concluded that no force of any character can be brought to bear that will disrupt the chemical union of two positive and one negative ultimate quantities. The only way that such a combination can be broken up is to alter the relation of all matter and all force to all space. It is this relation which dictates its constituent value. The facts pertaining to electrified partial vacua support the theoretical conclusions. The cathode particle is the tenuous ultimate which all ponderable matter strains to reach, and when reaching the progress of dissociation of ponderable matter reaches its finality. It is important to appreciate the fact that a cathode particle neutralized by the poles of ether molecules is in equilibration as regards the strain to neutralize at minimum distance and by maximum contact. It is the ultimate equipoise of the forces of ponderable matter (Fig. 2). It is also important to note the relation of the neutralization strain to the concentrativeness of ponderable matter. The neutralization strain is not accumulative, whereas the concentrativeness of positive matter is accumulative.

The dissociation of a mass caused by neutralization strain is effected by the strain of its surface molecules, which is not made greater by their being part of the mass. It is a localized property of the molecules and it effects a semi-chemical union between ponderable and ether matter. The neutralization strain of one particle is not added to the strain of adjoining particles—it is not a radiating force. On the other hand, gravitational force radiates and is proportional to the mass. Hence particles placed in vacua and free from the concentration of lines of force dissociate under the neutral-

ization strain; but the same particles placed in the midst of other positive matter or midst concenerating lines of force are solidified. It is clear that the neutralization strain is a dissociating force, is opposed by the gravitational force, and supported by repulsion between negative particles. The neutralization strain is the dissociating principle of positive matter.

THE PHYSICAL CHARACTER OF THE ETHER.

An epitome of the physical character of the Ether follows:

Ether Is Immolecularly Neutralizable. Its atoms of equal value possess minimum quantity, are purely of opposite quality, and neutralize at minimum distance and by maximum contact.

Ether is Imponderable. Ether is imponderable (1) because its atomic forces are neutralized at minimum distance and by maximum contact; and (2) because the universal equilibrium under the relation of all matter to all space is maintained by ether filling space not occupied by other matter.

Ether Is Non-cohesive. Ether does not possess the property of cohesiveness as its forces are immolecularly neutralized, and the condition is safeguarded by the construction of its molecules being such that molecular surface matter is negative in quality. The ether is frictionless, inviscid, and non-rigid.

Ether Offers Minimum Resistance to Moving Bodies. Ether possesses fixity only as a medium of radiating forces. By virtue of its imponderability and non-cohesiveness it offers no resistance to moving bodies by its intrinsic forces.

Ether Offers Minimum Resistance to Convective Currents. Electrified particles fly through partial vacua with decreased resistance directly proportional to the decrement of the gas to the critical point of there being no ponderable particles to electrify.

Ether Is Compressible. Free molecular interspaces allow ether to be compressed by the attraction and repulsion of its atomic forces—polarization—or by vibratory impulse—impact—thus lessening or obliterating its intermolecular spaces.

Ether Is Elastic. Ether molecules are distorted by pulsations or by polarizing forces, and by their intermolecular forces immediately resume their rotundity when the extrinsic force is removed.

Ether Is Porous. Ether molecules being globular must have interspaces, hence the substance is porous. Moreover, ether is the only substance which has a true porosity, as it fills the intermolecular spaces of other substances.

Ether Molecules Possess Impenetrability. That no two portions of matter can occupy the same space at the same time is an inherent property of all matter. A positive atom of ether does not mix with a negative atom.

Ether Cannot Be Projected. Being imponderable ether cannot be projected as ponderable matter is projected. Ether is incapable of acquiring a momentum.

Ether Density. The molecular mass of ether is just as dense as the molecular mass of any other matter. The tenuity of ether depends on its true porosity.

Ether as Insensible Matter. Ether is insensible because our senses do not identify it with sensation. It is insensible in the sense that it is imponderable. However, ether responds to all the forces and in this respect

it is sensible matter. Ether is the great medium in transmitting force. It is absolutely the only medium for the transmutation of the forces.

Ether Is Polarizable. The molecules of ether when free from extrinsic forces assume the globular form with a positive center and a negative circumference. By the push and pull of extrinsic forces the positive atoms become eccentric, the molecules lose their immolecular neutralization and transmit force by polarization. Thus the static forces of the universe radiate influences through ether, within their fields of neutralization. By polarization ether inductively acquires properties primarily possessed by ponderable matter.

Ether Is the Perfect Medium. Its imponderability, its compressibility, its true porosity, its delicate elasticity, its non-cohesiveness, its polarizability, together with the complete immolecular neutralizability of its forces, and its perfect equilibrium in space, allow the ether to be a perfect medium, transmitting force influences (polarizations), and radiations (undulations), without loss of energy, with minimum resistance, and with maximum velocity.

Ether Produces Chemical and Physical Changes. As ether possesses the property of impenetrability, when unequilibrated it is capable of chemically and physically dissociating ponderable matter, thus heat separates atoms, molecules, or masses, or allows them to separate by their intrinsic forces. If a mass of ether were confined at a maximum density ponderable matter could not gravitationally encroach on it.

Ether Atoms. When chemically dissociated ether atoms become Electric matter. They pass from the lowest to the highest physical potencies.

EVOLUTION OF A SOLAR SYSTEM.

We will now conceive that the star-space of the Solar system, as a sequence of the Creative act, is occupied by matter: (1) Ether, simple in its molecular construction and imponderable; (2) Complex or ponderable matter: (a) cathode particles, (b) anode particles. Ponderable matter is thus in extreme diffusibility. It must be noted that although all masses of complex matter are ponderable, that they are so by virtue of their positive constituents, and that their negative constituents, of equal aggregate value to the positive, are imponderable. Thus quantity and weight of matter are clearly differentiated. Mass if measured by weight does not exactly indicate quantity. Negative matter cannot be directly measured by weight, in fact it is opposed to weight by its resistance to compression in the concentrated field of a positive force. On the other hand, the strain of the medium between a positive and a negative body imparts to negative matter an attractive force. Opposed to this is the consideration that in a mass there is a certain amount of positive matter that is neutralized according to the law of distance and hence is unweighable. The amount of positive matter neutralized within a mass so that it is imponderable must vary according to its molecular constitution, always bearing in mind that positive matter strains to approximate the measuring force, and hence may be placed advantageously to be acted on. Weight at least indicates if it does not exactly measure the quantity of positive matter.

We are now in a position to show how the Solar system may be built up from anode and cathode particles. These are the maximum diffusible state of ponderable

matter, and their forces directly or inductively dominate the star-space of the Solar system.

Matter is without mass form. Its energy rests in the diffused state of cathode particles—in the gravitational force of diffused positive matter. A cathode particle surrounded by ether satisfies the strain to neutralize at minimum distance and by maximum contact (Fig. 2) under the quantitative relation of all matter and all force to all space; but cathode particles in diffusion possess a potential energy of mutual or mass attraction. Hence nuclear masses begin to form throughout the space, and anode particles assume circumferential positions. The nuclear masses being attracted by other nuclear masses larger masses will inevitably be formed. The differential arrangement resulting from positive matter seeking the center thus squeezing negative matter towards the circumference applies to the whole system as well as individually to the planetary masses, and coincident with these processes matter equilibrates in larger molecular quantities. The molecular form of matter is initiated and maintained by the strain of positive and negative matter to neutralize at minimum distance and by maximum contact. Attraction between constituent positives supported by gravitation, pressure, etc., tends to bring molecules together, thus increasing their size. Repulsion between constituent negatives tends to the disruption of the molecular form; nevertheless, negative molecules are relatively large as previously shown. Molecules and masses, by their intrinsic forces, assume the globular form, but as will be afterwards shown this form by extrinsic forces is modified towards the oval.

Here it is important to consider the evolutionary changes attending condensation: (1) Where cathode

particles predominate metallic substances will result. (2) Where equal quantities of cathode and anode particles prevail crystallization will occur. Both processes will be extended from nuclei, although these nuclei may unite after the processes are initiated. The crystallization will give the masses polarity. (3) Where negative force predominates matter will remain in diffusion.

The direction of the polarity will be uniform, not only as regards the solar star-space, but as regards cosmic space. It will be infinitely uniform. This will furnish a universal north and south with a qualitative distinction as positive and negative poles. A crystal is formed from a nucleus and the molecules polarize uniformly. The initiatory direction becomes the common or universal direction. The primary condensations are therefore crystalline rocks infiltrated by metallic deposits, as found in the unstratified rocks of the Earth. A planet grows, as a crystal grows, by extension, adding molecule to molecule, and molecular pole to molecular pole (Fig. 30).

Concurrent with the formation of solid bodies ether is set free from the molecular fields of the condensing elements. This ether will radiate as heat. It is evident that the mass in the center of the solar space is advantageously placed to excel in dimensions, and thus to dominate the system. Hence heat radiating from this body will be incident to a smaller proximate body. The latter, being polarized, will convert the incident energy into electric currents and these in turn will charge the poles of the smaller body (Fig. 7). What occurs is exactly analogous to that which occurs in a galvanic battery in which the positive zinc becomes negatively charged and the relatively negative copper becomes positively charged. In the case of the smaller body

the positive ponderable, or north pole, is negatively charged, and the negative ponderable, or south pole, is positively charged. A study of electrified vacua and of the facts relative to aurora polaris make it conclusive that these charges will form convection currents which will seek the central body—the energy emanating as heat from the larger or central body, and incident to the smaller body, will be returned by the latter as convection electric currents to the poles of the larger body (Fig. 7).

There are thus deposited at the poles of the central body differential electric charges and differential ions. The electric charges form currents from the poles to the equator, where they neutralize and are transformed into heat, and the ions build up the poles with differential forces (Fig. 8). This body is the Sun of the system. The smaller body becomes a proximate planet. The solar electric currents are the primary currents of the system with an induction field as extensive as the system. The primary currents swing the induction field into a great wheel-like form with definite rotatory directions, and we have thus a type of the Solar systems of the universe, which differentiate as to the contemporary phases of their great cycles, as to the quantities of their ponderable matter, as to the quantities of their energies, and as to the dimensions of their star-spaces, but are identical as to the principles and general forms of their evolutionary processes and cyclic energies.

CHAPTER II.

Reactions of the Forces of Distant Bodies.

The primary forces are *static* or *current*.

Reactions of Primary Static Forces. These are *direct* and *indirect*. The direct are the reciprocal actions of the primary forces through the media; the indirect reactions are those of media, by acquired properties, on primary forces. We will consider ether as the medium whose polarizing character we must bear in mind.

1. *Direct Reactions of Distant Static Forces.* (1) Attraction between distant positive forces. This is the gravitational force of Newton. It is lineal. Bodies possessing positive free forces are mutually attracted. The force diffuses through the medium so that its intensity is inverse as the square of the distance. Bodies with negative free forces develop positive poles on which the distant positive force acts. The medium is in contact with the positive pole, and according to the law of distance the induced force of the medium is advantageously placed to act on the pole as against the free negative force of the polarized body. The force produces a contractile strain on the medium and the medium quantitatively modifies itself by elimination. The curvature of the lines of force at the boundary of the fields indicate the mode of elimination (Figs. 4B and 5B. The contractile strain in the lines of force is caused by attraction between the positive atoms of the medium in which a force has been set free by neutralization of negative atomic forces in contact with the primary bodies (Fig. 3).

(2) Repulsion between distant negative forces. This force is lineal in character. It diffuses directly as the square of the distance traveled. It causes an attenuation of the medium by the mutual repulsion of the negative atoms in which a force has been set free by neutralization of positive atoms by the primary force. Bodies with positive free forces develop negative poles and the induced forces in the medium act on these, but negative poles usually assume a relatively distal position and are disadvantageously placed according to the law of distance. At the boundary line between approximate induction fields of negative bodies the lines of force are straightened and matter is absorbed by the fields (Figs. 4B and 5B). It is mainly through this force that negative electric currents travel.

The *differential positions* assumed by the poles of magnetic and electrolytic bodies should be emphatically noted. Two bodies with positive free forces whose constituents are free to mutually respond to the external influences will present their positive poles. If one is fixed and dominating a like relative position will be assumed by the other responding. If both bodies possess fixed constituents, and hence irresponsive to the extrinsic influence, proximate negative poles will be maintained in position, although a strain no doubt is imparted to the constituents of both to alter their relative polar positions.

Two magnets whose negative poles approximate maintain the relative position. The Sun and Earth during a definite period of the year mutually present their negative poles without material disturbance of the main bodies. That there is a disturbance in detail will be shown in the analogous action of the Sun on the water of Mars. On the other hand, a comet, whose constit-

uents are not fixed, presents its electrolytic positive pole (head) to the positive of the Sun, and the same pole to the negative of the Sun, a demonstration of the fundamental laws of attraction between positives and repulsion between negatives. Two comets, independent of external influence, would approach each other (if approachment were possible) head foremost, and mutually depart tail foremost. The moon as an electrolyte constantly presents the positive pole to the Earth, thus following the example of a cometary body towards the Sun.

(3) Neutralization between a positive force and a distant negative force. The forces neutralize through the medium by means of an induced polarized strain, and the medium thus acquires an elasticity. The medium, however, remains in static equilibrium up to a critical point—rupture—in the intensity of the radiating force. Up to the point of rupture of the medium or a specific intensity of the force, the direct action of distant forces of opposite quality is simply neutralization without any kinetic reaction between the bodies (Figs. 4A and 5A). However, at the instant when the polarized strain is initiated there must be some attraction induced.

2. *Indirect Reactions of Distant Static Forces.* (1) Repulsion between distant forces of like quality caused by impenetrability and elasticity of fields of force distorted under pressure. Each free force inductively radiates through a field toward a point of neutralization. Fields of force of like quality are mutually impenetrable, are distorted under pressure, and acquire an elasticity which exercises a repulsive force on the primary bodies. Under pressure the lines of force are bent as in Fig. 5B. The repelling force allows the lines to straighten, and brings more matter between the

primary bodies. It is clear that the repulsive force of the fields will support the direct reaction between two negative bodies, and will act against the direct reaction between two positive bodies.

Negative molecules or negative bodies mutually repel by direct and by indirect reactions. Positive molecules and positive bodies repel each other by the elasticity of their fields to the critical point of equilibration, while they attract each other by a direct reaction between the primary forces. It is thus that positive molecules have free intermolecular fields while possessing adhesive properties. We will see that similar conditions prevail in the case of celestial bodies. It is through the impenetrability, distortion, and consequent elasticity of fields of force that magnetic and electrified bodies manifest repulsion under the law "Likes repel." It is mainly through the impenetrability of like fields that positive electric currents travel.

(2) Attraction between a positive body and a distant negative body. The medium acquires an elasticity from the polarized strain which reacts on the bodies, and when the primary forces are intense, causes attraction. Thus attraction between magnetic and between electric bodies manifest under the law of "Unlikes attract." The attraction is mainly caused by the action of the positive force on the medium and is partially opposed by the action of the negative primary force on the negative atoms of the medium (Figs. 4A and 5A). Perhaps all kinetic energy between bodies of different quality should be classed as direct.

(3) Repulsion of negative matter from a concentrated field of force. Positive forces induce concentration, and negative forces resist concentration. A negative particle placed in a concentrated field will be

squeezed out by the lines of force. Two positive bodies being attracted will squeeze out a negative body. This is an indirect repulsion between positive and negative forces. We will find that each particle of a comet as the cometary body approaches the Sun finds an equilibrated position amidst the solar lines of force, where attraction ceases. Filling a hole in the earth with sand squeezes out the air. This is an example of attraction between two positive bodies repelling a negative body.

In Fig. 3 let the plus symbol within the lower circles denote the positive free forces of two bodies. As indicated by the outer arrows the direct reaction between the bodies is attraction. Let the minus signs within the upper circles denote the negative free forces of two bodies. As indicated by the arrows the direct reaction between the bodies is repulsion. The direct reaction between an upper body and a lower body is simply neutralization. The direct reactions are directed through the medium by a polarized strain which bestows on the medium new properties which react on the primary forces. If the polarized strain is relatively below a critical degree of intensity no other actions manifest except those of the primary forces.

If the strain on the medium is above a certain critical point it manifests properties of its own which may support or oppose the reactions of the primary forces. For instance the fields of two lower bodies (Fig. 3) being alike and mutually impenetrable, their lines of force under pressure bend as shown in Fig. 5B, thus undergoing distortion and assuming an elasticity which will manifest as a repulsive force between the two primary bodies. The repulsion depending on the elasticity of the fields opposes the action of the primary forces, as indicated by the inner arrows.

The fields between the upper or negative bodies (Fig. 3) are also impenetrable, are distorted under pressure, and assume elastic properties which manifest as a repulsive force between the two bodies, but it is evident that the acquired property of the medium and the direct reaction of the primary forces support each other.

The field between a positive and negative body being also under a strain (Fig. 3), the medium acquires elastic properties which may produce a pull on the two primary bodies as in the case of magnetic poles of different qualities; or the field may be ruptured as in the case of an electric current.

Another important property acquired by a medium is its repulsive action on negative matter by its concentrated lines of force. It is evident that lines of force by drawing particles towards a common center concentrate the particles. Negative matter by its diffusibility resists this concentration and hence is squeezed out of the field. Thus an indirect repulsion is induced between positive and negative forces. If we suppose a negative particle placed within the field of a lower body (Fig. 3), we can see that the field will squeeze out the particle until it reaches a position of equilibrium. Such a position will depend on the degree of concentration of the lines of force and upon the expansile power of the particle.

Another indirect method of repulsion of negative matter is by the direct attraction of positive bodies. A negative body placed between the two lower bodies (Fig. 3) will be squeezed out by the approximating positive bodies.

Reactions of Primary Current Forces. These are more clearly manifested in the case of electric currents,

although other currents must be governed by the same principles.

1. *Reactions of a Primary Current Force and Distant Static Forces.* We will consider the reaction between a primary electric current and static forces in the induction field. Around a primary electric current there is a whirl which has constant direction for a constant quality of force. Fig. 15 shows a wire through which is flowing an electric current. Within the electric field is placed the positive pole of a magnet bent and pivoted in such a way as to be free to rotate. The direction of the positive current is from A to B. The positive pole rotates from left to right as indicated. Maxwell formulated the following law: "The direction of the current and that of the resulting magnetic force are related to one another as are the rotation and forward travel of an ordinary (right-handed) cork screw." The author has formulated the following general law: Facing an approaching positive, or receding negative, primary current, a positive force responding to the induction rotates from right to left, and a negative force responding to the induction rotates from left to right, in the upper segment of the cycle.

2. *Reactions Between Induction Fields of Primary Currents.* Ampere has formulated the following laws: (1) "Parallel electric currents of opposite direction mutually repel; those of the same direction mutually attract." Fig. 13 indicates the manifestation of this law. When the currents are of the same direction the lines of force tend to embrace them; when they are opposite in direction the lines of force tend to pass between and repel them. (2) A series of laws may be summed up: "Currents obliquely directed induce stresses in the surrounding media, tending to straighten

their paths, as nearly as possible, in parallel direction."

(3) "The force exerted between two parallel portions of circuits is proportional to the product of the two currents, to the length of the portions, and inversely proportional to the simple distance between them." This law of Ampere is fundamental to Kepler's second law: "The radius-vector of a planet describes equal areas in equal times."

Motions resulting from the reactions of distant forces may be lineal, spiral, circular, or elliptical.

It is evident that the motion produced by the reactions of the static forces of two bodies can be no other than lineal. The conclusion is inevitable from the interpretation of relative facts that the orbital revolution of a body has as a chief causal factor a central current force. We expect to show that an ellipse is a compound of lineal and circular motion. It may be postulated that the circular element of orbital motion is evolved from the spiral form. We will consider two elementary motions: (1) Lineal motion caused by the push or pull of a static force; (2) Spiral motion caused by the push or pull of a current force. When the distance between the poles of the current force is small relative to the distance between the primary current force and the moving body the motion approaches the circular form. Thus we may regard circular motion as elementary. The primary electric current must also take on a spiral motion and this we have conceived as depending on the orientation of molecules in the primary conductor. The orientation of molecules is a subject of deep scientific importance which we have discussed elsewhere.

Reactions of the forces of distant bodies which produce motion may be classified as follow:

(1) *Reactions between distant static forces (mass or polar).*

(2) *Reactions between distant current forces.*

(3) *Reactions between a current force and distant static force.*

The reactions may be direct, the motion being the result of reaction of the primary forces; or they may be indirect, secondary or induced, the motion being the result of an acquired property of the medium. The motion may be compound in which any number or all of the reactions are factors.

It is in the Earth's orbit that we can best study these forces. The electric currents of the Sun produce a circular motion by acting on the static forces of the Earth. North of the equator of the Sun the orbit is contracted by the direct reaction between positive static forces: south it is dilated by the direct reaction between negative forces. The reactions which produce seasonal changes are indirect or secondary. The orbital revolution of the Earth is compound and embraces all of the reactions named. The Moon is a case of a body under the influence of the static forces of one body while answering to the current forces of another. The orbital motions of a comet are less complex than those of the Earth or of those of the Moon.

Force and Energy. Let us here define what we mean by force and energy. Our conception of force is that it rests on the three primary properties of matter: Attraction between positive bodies; repulsion between negative bodies; and the mutual strain to neutralize at minimum distance and by maximum contact. We will define energy as force changing its relative position or seeking equilibrium in obedience to the fundamental properties of matter. Energy is unequibrated force seeking equilibrium. The energy of a state of matter is that departure from equilibrium as measured by a specific criterion. Thus the difference in the equi-

bration of ether and electric matter is the energy of electric matter. The difference in the equilibration of oxygen and coal on the one hand and carbon dioxide and water on the other is the energy of the former. If we speak of potential energy then we must conceive of a force available for change of relative position. The energy of the ideal creation embraced the forces of the electric masses. The energy of the ether resulting from the union of the electric masses was the strain to neutralize by greater contact and at less distance which was not resisted by pressure. The succeeding pressure changed this energy to attraction between cathode particles which is virtually mass attraction. Only a very small portion of the forces of the universe can assume energy conditions at any one time, the remainder being in different states of equilibrium to which the energy conditions must be related. It is evident, however, that as the ether molecule and the cathode particle are the ultimate equilibrates as regards electric and ponderable energy all forces are capable of assuming energy conditions. The energy of the solar system consists principally of that stored in the Sun, which in the main is diffused positive matter. It may be postulated that however placed, and whatever physical condition matter of the solar system may be supposed to assume, the relation to space and its inherent properties would impel an arrangement so that its energy conditions would be constant. All the forces of the universe could not possibly be placed in equilibrium at the same time. The forces of the solar system, or those of any other celestial unit, based on the properties of matter as stated, demand an unequilibrated portion as energy.

CHAPTER III.

The Solar System.

The solar system in its entirety possesses four significant features: (1) Its wheel-like form; (2) its isolation; (3) its polarization; (4) its intrinsic neutralization.

No known force can account for the wheel-like form of the solar system except electric currents, and those placed in the central body, the Sun. The plane of the Sun's equator cuts the wheel into two equal parts, and this may be conceived as the normal plane of the orbits of the planetary bodies, and their obliquities accordingly should be calculated from this plane. If the poles of the Sun were simply solargraphical expressions, having no differential potentialities, there would be no wheel-like form of the solar system. All calculations of the positions of the bodies of the solar system, or of their orbits, should be made in reference to their relations to the plane of the solar equator, or in reference to the solar poles.

The isolation of the solar system is kinetically complete. It takes light four years to traverse the intervening space separating it from its nearest known neighbors. No ponderable matter can ever cross this ethereal ocean. Its dimensions are determined by the quantitative relation of all matter and all force to all space, and by the relative amount of the inductive force of the solar system. The star-space of the solar system cannot be invaded by external ponderable matter, its dimensions are definite, but it is modifiable in form because occupied by a body of matter which is elastic and

subject to continual change in the character of its energies.

The system has a common direction of polarization, that is to say all the north poles of the bodies are qualitatively positive and all the south are qualitatively negative. The differentiation as regards the planets is primarily caused by the direction of the axes of crystallized bodies, but an electrolytic arrangement occurs under the influence of solar attraction and repulsion, as we will show when considering the evolution of a planet. The polarity of the universe is a determining factor in the direction of the polarity of the solar system, and may be the only cause of maintaining this direction during the nebulous phase of the great cycle. A common direction to a general or cosmic polarization will allow the media, between solar systems in north and south directions, to be in equilibrium, thus in these directions neither attraction nor repulsion occurs between solar systems. At right angles to this general polarity we will show that there may be slight repulsion between systems. This we will further discuss when we consider the influence of the Sun's forces.

The capacity of the solar system for self neutralization is an important feature. Any form of a contradiction of the postulate that the system is self neutralizable is inconceivable. The isolation of the system suggests the conception, and the intrinsic phenomena of the system support it. The positive matter and the negative matter of the universe must be quantitatively equal. The apportionment must be such that each star-space or each solar system as a cosmic unit contains equal quantities of the qualitatively differentiated ultimate elements of matter. Each solar system possesses an auto-sufficiency for its own evolutionary processes; and

the cycles induced by its energies constitute a perpetual motion.

We will now proceed to discuss the features of the elementary bodies of the solar system (Fig. 6).

THE SUN.

The forces of the Sun dominate the system. Recognizing this fact we will consider the various elements of the system from the viewpoint of the Sun, and from the standpoint of his dominance. The forces of the Sun may be classified as follows: (1) Mass attraction; (2) electrolytic attraction and repulsion; (3) heat and light; (4) electric currents.

Mass Attraction. Positive matter predominates in the Sun's mass. The only negative element that has been detected by spectrum analysis is helium, and that is probably nascent and escaping with lightning speed from the squeeze of a concentrated field of force. The positive mass of the Sun draws toward it the positive matter of the solar system. The matter of the field is thus concentrated. What is important to understand is that the solar lines of force passing through the ether concentrate this substance as well as ponderable matter. In the ether each line of force must be the breadth (thus differing from the geometrical line) of an ether molecule, and the distinguishing character of the line must be a polarization. The ether invariably presents its neutralizing pole to the primary force (Fig. 3). The force is thus propagated by each distant pole polarizing the succeeding molecule. These lines of force partake of the same character as Faraday's lines. Negative matter when dominant, owing to its inherent diffusibility, resists concentration and is squeezed out of the field, be that an ether or a ponderable field. The result

is that, generally as regards ponderable matter, the positive variety, which may be considered as the only matter giving ponderable reactions, prevails in a proportion inversely as the distance from the Sun, and that negative matter prevails in a proportion directly as the distance from the Sun. There are a few exceptions to this rule which we will afterward point out. This rule does not apply to ether, as in this substance positive and negative matter is quantitatively equal throughout the universe.

Gravitational force is absolutely lineal. It holds the planets in position against repelling forces. It throws a blanket of concentrating lines of force over all planets. The Earth is more concentrated than Neptune. Put the Earth in the position of Neptune and it would immediately diffuse into the condition of the latter, coincidentally altering the relative amount of its positive and negative constituents.

The Sun dominates and his mass attraction concentrates even the minutest molecule. The water molecule under the law that positive and negative matter strains to neutralize at minimum distance with maximum contact would break up into oxygen and hydrogen were it not for the blanket of concentrating force spread by the Sun. The same concentrating influence is exerted on all matter, even on the ether. Where this force is attenuated as in the outer planets, matter diffuses by its own inherent properties.

The forces of the lines emanating from the Sun divide and redivide as they pass through the ether molecules, thus diffusing directly as the square of distance. The force of each molecule of the medium acts by contact on the succeeding. The force diffuses as the square of dis-

tance, but the diffused force acts by contact and at zero distance.

It is a mistake to suppose the outer planets to be at a high temperature. The Sun is the only body at a high temperature. The outer planets are no hotter than the Earth's atmosphere. They are diffused by there being present a relatively large amount of negative matter, and by the solar lines of force being weak at that distance. Each planet is in an equilibrated position and condition, and the only modification that can occur is from a change in the relative influence of the Sun.

Gravitational force retards orbital rotation by acting lineally on the proximate surface of the planet, thus producing an axial rotation analogous to that of a ball rolling on a floor. This is the case of the planets from the Earth to Uranus, inclusively. When the gravitational lines of force are intense the retardation becomes actually inhibitory to axial rotation, as in the case of Mercury and probably Venus. The inhibition is favored by unequal hemispheres. The Earth will lose its rotation with the eastern hemisphere approximating the Sun. The satellites have no axial rotation (from the standpoint of their orbital centers), because of their approximation to their principals whose fields of force inhibit the movement. We will further discuss this fact when considering the case of the Moon.

As the gravitational force radiates outward it is gradually neutralized by forces radiating from negative matter. The radiations of the forces of the solar system as well as the matter of the system, in the main, preserve the wheel-like form. The negative matter of the system being driven outward by the concentrated lines of force of the Sun in part collects as a *common atmosphere*, from which radiate lines of force of a diffusive

character. These meet and are continuous with the solar lines, and thus they neutralize as do the lines from the differential poles of two magnets.

It is important to note the concentrating effect of the solar lines of force on the matter of the solar system. It is equally important to note the diffusive effect of the lines of force of the common atmosphere on the matter of the system. The solar lines of force and the atmospheric lines of force must be equal in quantity, opposite in quality, producing opposite results, and mutually neutralizable. As the radiations diffuse according to the law of distance there must be an inward sphere where solar lines predominate and an outward sphere where atmospheric lines predominate. As the concentrating forces emanate from the Sun, and the diffusive forces emanate from the common atmosphere of the system, it is evident that these forces overlap with no distinct line of demarcation. The forces, however, have spheres of predominance, and the planets have thus been classified as the inner and outer groups.

Electrolytic Attraction and Repulsion. The Sun is an electrolyte or magneto electrolyte. The Sun is analogous to an electrolytic body of water with free oxygen at one pole and free hydrogen at the other. Water, H_2O , is positive and has mass attraction. The free hydrogen being positive reinforces mass attraction. The free oxygen being negative furnishes a negative free force, which, in a clear field, will repel another negative force. Fig. 7 represents the electrolytic arrangement of the Sun. The north pole being positive simply reinforces solar mass attraction. As the south pole is negative its radiations neutralize the free force of positive matter, but actively repel negative matter. A body such as the Earth, revolving round a polar body

such as the Sun of immensely superior forces, passes through two main orbital phases, the character of which determines the form of its orbital path. In this we must consider circularity as the normal orbit. The orbital phases of the Earth are caused by the differential qualities of the fields of force north and south of the plane of the Sun's equator. The solar lines of force envelop the Earth so completely that they are the main factors in causing a contraction or dilation of the Earth's orbit from normal circularity. When north of the Sun's equator the Earth is amidst positive lines and the orbit contracts, when south it is amidst negative lines and the orbit dilates. We have, however, to consider that the momentum of the revolving body tends to expand its orbit. We will hereafter consider the modification of the Earth's orbit by the planet's forces differentially reacting with the solar fields of force. It will be observed that the plane of the solar equator divides the fields of polar forces, and this division will be made plain when we discuss the problems of cometary bodies.

Heat and Light. This energy principally emanates from the equatorial regions of the Sun. It is doubtful if much heat or light radiates from the solar body north or south of the regions of Sun spots. Fig. 28 is significant of this fact. We have elsewhere followed the cycle of energy: From the Sun as heat and light to the planets, there transformed to electric energy and thus returned to the Sun. If the energy from the planets were cut off from the Sun his radiations would be as effectually quenched as the light of a candle by snuffing.

This energy has some repelling force on bodies on which it is incident. This fact has been raised in importance to account for certain repelling influences of

the forces of the Sun. The position thus given it cannot be sustained. Thermic energy, however, produces important results in as much as it diffuses positive elements. If Mercury has any atmosphere it is composed of a positive gas such as hydrogen; the high albedo of Venus is likely owing to the accumulation of hydrogen gas in the upper atmosphere of that planet, that gas being diffused by the solar heat, and by such heat kept from uniting with oxygen. It will be observed that solar heat thus opposes the concentrating action of solar gravitation.

It is well to mark the fact that the solar heat and light constitute an arm of a cycle of energy which converts a planet and the Sun into a double thermo electric cell (Fig. 7).

Luminous radiations probably extend a greater distance into space than any other force. The relation of heat and light to electric currents, however, must not be forgotten, and it is likely that a delicate instrument might convert the light of a distant star into electricity. No natural difference of potential is presented to the energy of a star by the solar system, hence no motory influence can be exerted between solar systems. Kinetic energy is intrinsic to solar systems.

The Electric Currents. The electric currents of the Sun are the revolutionary forces of the solar system. We have previously formulated the law of induced revolution: "Facing an approaching positive, or receding negative, primary current, a positive force responding to the induction rotates from right to left, and a negative force responding to the induction rotates from left to right, in the upper segment of the cycle."

We must note the advantageous position assumed by positive matter in being acted upon by a central force. A magnet within an electric field follows its positive

pole. A body even when possessing a negative free force develops a positive pole which may direct its motion. When a body is predominately negative it then follows negative direction. A bound negative force as in the case of the south pole of a magnet strains to move in the opposite direction to that of the positive force. When the forces are free of each other's influence they follow opposite directions, as in the induced electric current. In the latter case the ether molecules are dissociated just as if the magnetic molecules were divided into poles.

The law then denotes that within an induction field positive and negative ultimates are placed under a strain which impels them in different directions.

Now let us mentally stand off the north pole of the Sun, so that we can take a general view of the solar system. We see Mercury and all the planets revolving round the Sun from right to left in the upper semi-circle (Figs. 6, 14); and we see from Fig. 7 that the negative current of the solar body is receding and the positive current approaching when we occupy this relative position. The positive bodies of the solar system are therefore obeying the same law as positive matter within the induction field of an electrified wire.

How does the negative matter of the system act? If bound to positive matter such as the Earth's atmosphere, it will be dragged along by the positive matter as in the case of the negative pole of a magnet. On the other hand, if sufficiently free from positive matter as in the faradic current, it will seek the opposite direction.

We have shown that within the solar induction field negative matter is squeezed out by the concentration of the field. Negative matter is also squeezed out of con-

centrated fields surrounding planets. We find the Moon a positive body holding an equilibrated position within the solar induction field, and having the orbital direction of its principal. It obeys the revolutionary law of positive matter. Jupiter is a less positive body than the Earth because it occupies a less concentrative solar field. It has a number of satellites, each one no doubt occupying an equilibrated position. According to the law of concentration we expect to find evidence of the satellites of Jupiter being more diffused and more negative in direct proportion to their distance from Jupiter. Here is the evidence: All the satellites of Jupiter revolve directly, thus obeying the law of positive revolution, except the outer one, which has a reverse movement, thus obeying the law of negative revolution. The satellites of Saturn behave in a similar manner to those of Jupiter, the outer one revolving reversely.

In the case of Uranus the proposition is modified. The solar induction field is more attenuated, and the planet is more negative and diffused. Hence the planet's induction field is less concentrated. Hence the equilibration of the satellites admits of a construction more negative than the corresponding satellites of Jupiter or Saturn. The four satellites of Uranus obey the law of negative revolution.

A further modification exists in the case of Neptune. Here there is a greater negative construction almost approaching cometary conditions. The planet, however, obeys the law of positive revolution, owing to the relatively advantageous placement of positive matter. The satellite, as might be expected, revolves reversely to positive revolution. The axial rotation of Neptune is retrograde, and this is a most interesting fact.

Outward from Neptune the lines of force traversing the solar induction field are extremely attenuated. Positive matter has lost its revolutionary supremacy and here negative matter claims dominion. No cloud ever interferes with the true transparency of the atmosphere of the solar system, even the spectroscope will ever fail to detect it. However, the quantity of matter diffused beyond the orbit of Neptune must be very large and probably covers a space equal to or greater than that embraced within the orbit of Neptune. Nevertheless, the electric currents of the Sun direct this matter in its orbital revolution and the direction is reverse to that of the planets. When we mentally stand to the north of the solar system the atmosphere of the system revolves from left to right in its upper semicircle (Fig. 6).

It is now clear why Neptune has a retrograde axial rotation. The other planets have a rotatory direction the same as a ball rolling on the floor, and Neptune has a rotatory direction the same as a ball rolling on the ceiling. The positive lines of force of the Sun direct the former, and the negative lines of force from the common atmosphere direct the latter.

The lines demarcating the spheres of influence of the forces of the solar system differentiate according to the character of the force. (1) The spheres of solar lineal attraction and lineal repulsion are divided by the plane of the solar equator. (2) The sphere of physical concentrativeness and the sphere of physical diffusibility are divided by a line demarcating the inner from the outer planets. These, however, are imperfect demarcations. (3) The sphere of influence of the electric currents of the Sun uniformly extend throughout the whole system, only diffusing, and this is the case with solar heat and light.

A line dividing the revolutionary directions of positive and negative matter may be said to exist between the planets and the common atmosphere, although within this line the axial rotation of Neptune, and the orbital revolutions of some satellites and comets have the direction of negative matter.

The Sun dominates the system. His influence extends to the remote regions beyond Neptune, although here his lines of force are weak and the atmospheric lines are strong. The negative force disputes his concentrating influence and dictates by negative resistance physical states of matter, but as regards kinetic force he still holds sway and his authority is not even disputed. The Sun dominates motion, and he also dominates all change, for each part of the system beyond his mass is in equilibrium and is incapable of further change through the initiation of its own forces. The Sun is positive or cation in mass and is positive and aggressive in character; the common atmosphere of the system is negative or anion in mass and is negative and resistant in character. Nevertheless, the Sun is as much dependent on the planetary part of the system for his energy as the planets are on him for their energies. The Sun, however, contains in the main the stored energy of the system; the energies of the planets are principally induced.

The computation of the mass and density of the Sun is based on the present accepted conception of gravitation. According to our deductions gravitation is limited to one-half of the matter of the universe. It is evident that if the concentrativeness of positive matter is the fundamental principle of gravitation the computation of mass and density in general must be somewhat wide of the mark.

The Sun's axis is the center of the solar system. Its direction indicates the true north and south as regards the system, and its plane cuts the system into two equal parts. The equatorial plane of the Sun also divides the solar system into two equal parts. These two planes should be the landmarks which should relatively indicate the localization of all other points within the system. This does not exclude the ecliptic. The solar planes in their relations to the parts of the system may be considered as invariable. The ecliptic is variable. The solar planes bear a direct causal relation to the lines of the universe, the ecliptic bears a direct causal relation to the solar planes. The ecliptic has an obliquity of about seven and one-half degrees. The solar planes are straight. That the lines and planes pertaining to the solar system should be regarded as related to the ecliptic is an inherited mark of the Ptolemaic conception of cosmical arrangement.

Photosphere. The photosphere is mainly composed of matter whose forces tend toward the solid state, kept in the liquid or gaseous form by heat. The photosphere is the product of one vast volcano which is normal and general to the Sun's surface between 45° north and 45° south latitude. The volcanic condition is rare as well as abnormal—at least at present—to the Earth's surface. If it be supposed that the material of the stratified rocks covering the Earth is in a molten state, caused by heat generated at innumerable foci within the unstratified rocks, and that this heat is the energy derived from electric currents selectively passing through the unstratified rocks, part of which is also rendered molten, we may gain a conception of what is occurring within the photosphere and its relation to the interior of the Sun.

Rotation of the photosphere is demonstrated by the movement of Sun spots. In the equatorial zone the rotatory period is about 25 days, while at the latitude of 40° the period is 27 days. In a solid body, such as the Earth, this differential rotation is absent, although it may be present in its atmosphere. It manifests in Jupiter, and may be present in all the outer planets. Differential rotation appears to have two causal factors: (1) The intensity of the free force of the particle acted upon. This, in the case of the photosphere and planets, means the intensity of the positive force responding to the induction. This factor is more particularly shown in the case of the rotatory periods of the belts of Jupiter. (2) The polar forces of a body, being opposed to the current forces, must exercise an inhibitory action on the currents and their effects. This is demonstrable by passing a current through an electrolyte, the ions accumulating at the poles decreasing the primary current. Thus rotatory motion will be inversely proportional to the retarding polar force, or directly proportional to the distance from the poles.

CHAPTER IV.

The Great Cycle.

The Sun grows. The conception brings into view law, order, system, absolute conclusions, certainty, evolution, cyclic change, death only to a phase. The Sun contracts. The kaleidoscopic views are accident, catastrophe, cataclysm, cosmic complexity, awe, doubt, death, accidental awakening.

The Sun grows. Charged ions emanating from the poles of the planets and deposited at the poles of the Sun build up his mass, increase his forces, feed his energies, and extend and intensify his dominion over the positive or cation matter of the system. The results in the solar body may be expressed in the term *ionization*. Step by step the mass of the Sun extends its boundaries until the whole system is ionized. Concurrently, the changes occurring as regards the planets are cationization, contraction of their orbits, decrease of their masses, and finally absorption by the Sun. The changes occurring in the common atmosphere of the system are increase of quantity, and enlargement of sphere. The atmosphere will first of all be pushed out during the period of planet building. When the last planet has been formed and when in its situation it has corresponded to Bode's law, then as the orbit of this planet contracts the inner boundary of the common atmosphere will also contract. The last planet of the system, when it is absorbed by the Sun, may have an orbit corresponding with that of Jupiter or that of Saturn. When the last planet is absorbed by the Sun the Sun will have lost his identity. A dark mass of gaseous matter revolves in space by its momentum.

There are no electric currents. It is nebulous. There is, however, a solid *condensation* at its center, the portion of the former Sun specially endowed with the property of electric conductivity. There is also an electrolytic polarity which constitutes the north and south. Matter has reached the highest degree of diffusibility—the nebulous phase of the Great Cycle of solar systems.

There is, however, an intimate division in this nebulosity which is portrayed in the state of matter of a partial vacuum tube as manifested by electrification. In an extreme partial vacuum there are two forms of ponderable matter, the anion and cation particles, showing a condition of ultimate tenuity. Matter in a nebulous star system may be made up largely of the same particles mainly divided into two spheres. The anion sphere being an extension of the negative atmosphere or rim of the system, and the cation sphere being an extension of the Sun or center of the system. The anion sphere covers an immensity of space, whilst the cation sphere is relatively small. The energy of the system resides in positive or cation ionization.

In this work we have attempted briefly to trace the changing conditions of the solar system from the nebulous state succeeding an ideal creation of matter, through the various phases of planetary life, back to the nebulous state. From the succeeding nebulous condition of the matter of the solar system new centers of concentration will be evolved, a new cycle of physical change will ensue, a new cycle of energy will be initiated, and a new cycle of organic life will manifest.

The solar system has marked time by passing through one great cycle of infinite time, and is again the seat of intelligent effort. One planet, the third from the Sun, is in that equilibrated position which is productive of

cell life. What gift of prescience would the human mind of today possess if it could picture the geography, the physical forms of the animal and vegetable life, and the civilization of the higher life of that planet as it passes through the evolutionary era corresponding to our own, and only ahead one turn of the wheel in the Great Cycle. Will you and I be there?

THE ENERGY OF THE SOLAR SYSTEM.

Under the quantitative relation of all matter and all force to all space each solar system, by virtue of an induction field, is in equilibrium as regards its cosmic environment. The energy which imparts motion to ponderable bodies is not interstellar but confined to cycles which are complete within each system. We can conceive that the forces within the solar system are in equilibrium with the exception of an unequilibrated fraction which is seeking equilibrium. This fraction is the kinetic energy of the system.

The energy conditions of the solar system may be understood by a study of Fig. 3.

(1) *The Concentrability of Positive Force.* In the immense accumulation of cation elements held in diffusion resides the potential energy of solar radiations of heat. As simple radiant energy light may be considered on the basis of its thermic value, and hence embraced under the term heat. It is the tendency of the cation elements to contract which impels the ether to radiate as heat. Yet the elements of the solar body do not contract, because the heat transformed from electricity diffuses the cation matter. This energy is in the main returned to the Sun, but some of it has been, or is being stored in the planets, chiefly Venus, the

Earth and Mars, as chemical energy such as found in organic matter. The solar energy radiates chiefly along the plane of the equator of the Sun, some of it, however, passes beyond our star-space, the Sun thus manifesting beyond as a twinkling star. At the boundary of our star-space the outgoing and incoming radiations are equal, so that the solar system gains exactly as much energy as it loses. Within the boundary of the system the sum of the potential and kinetic energies never varies. The Sun cannot give out more energy than he receives, and each polar body within the solar system is engaged in sending back what it receives.

Solar radiant energy non-incident to a polar body will meet resistance in fields preoccupied by radiations from other systems. It is evident that resistance to the escape of energy from the system increases the pressure within the system, hence from this cause the pressure at the surface of polar bodies is increased. The planets therefore, although only directly catching a small amount of the solar radiant energy, yet being in the midst of a pressure caused by the resistance to non-incident radiations, clearly, as polar bodies, will transform this pressure into electric force, and thus the energy will be returned to the Sun.

The diffusion of cation elements in the body of the Sun as a potential force is unique as regards the solar system. Neither is there any analogous compression of negative matter. The Sun is the only self-luminous body within the system and the solar body alone possesses a potential energy in the diffusion of its elements. Other bodies reflect solar energy, or absorb and then emit it.

(2) *Free Cation Force.* The free cation force of the Sun includes the free force of his north pole and of

his general mass; only excepting his south polar force. It radiates lines of force which concentrate the positive matter of the system, squeeze out negative matter, and contract the orbits of planetary and cometary bodies. The free cation forces of planetary bodies radiate independent lines of force which act on their respective satellites, and contract their orbits.

(3) *Free Anion Force.* The free force of the south pole of the Sun is negative in quality. It radiates lines of force which directly repel the negative matter of the system and dilates the orbits of planetary and cometary bodies. The free forces of the south poles of the planetary bodies dilate the orbits of their respective satellites. The free negative force of the common atmosphere of the system radiate lines of force which have an expanding influence over the negative matter of the system. These lines of force may exercise a repelling influence on the tail of a comet as it approaches the Sun.

(4) *The Diffusibility of Anion Force.* The normal position of negative matter is circumferential as the normal position of positive matter is central. In the Sun, however, we find positive matter held in a diffused state, and hence possessing potential energy. No such corresponding energy is possessed by the rim, which would be in the nature of a compression. The negative matter of the common atmosphere is diffused to a point of equilibrium, and hence there is no storage of energy. Probably there are no qualitative changes, except such as are induced by solar energy, occurring in this circumferential band of matter, and it simply stands guard over the more active center. Anions are dragged towards the center of the system by their physical union with cations, acquire energy which becomes active by change of relative position, as mark

the repulsion between a comet or a planetary south pole and the south pole of the Sun.

(5) *The Strain to Neutralize by Maximum Contact and at Minimum Distance.* As positive and negative electric currents energy is generated by the difference of potential of the planetary poles. There is also the im-molecular and mass strain of positive matter forming the solid portions of planets, but this is overcome by a blanket of concentrative force thrown over the planetary bodies by the Sun, and hence is not independent energy.

Besides these there are strains of polarized media induced by the several primary forces. No doubt chemical action plays an important part in the construction of planetary masses, but synthetic reactions only occur between positive and negative elements when they are brought in contact by ponderable pressure.

The energy of the system is essentially the potential energy of the Sun. A variable portion of the radiant energy of the Sun is stored in the planets. The reddish luminosity of Jupiter is absorbed solar energy. The electric currents of the planets are solar energy returning to its source. Chemical energies stored in organic matter in the three inner planets named have been lent by the Sun for a longer period. Mercury has probably returned this energy to its giver. The planets have an independent potential energy in their polarities which enables the radiant energy of the Sun to be returned to him.

This pictures the energy of the system as it stands at present. As the Sun grows the positive matter of the proximate planets is ionized and is added to the solar body, and by this process additional energy is stored in the solar mass. By their polar radiations the planets

may partially lose their polarities, and by the concentrativeness of solar lines of force they lose a large portion of their negative matter, so that when the crises come and they are one by one engulfed by the solar body they are chiefly cation cinders.

In the transitional stage when the solar system is one continuous mass of nebulous matter the potential energy still resides in the diffused positive matter. The radiating energy has been reduced to a minimum, but the stored energy in cation matter has reached its maximum. The thermo electric cycle is broken and the nebulous mass continues to revolve by its momentum. Then the cation matter of the central parts of the system contracts, a new and smaller Sun is evolved, a new planet is formed proximate to the solar body, and a new cycle of energy springs into existence. It is then that electricity is born anew.

The energies of the solar system are a play between the forces as indicated in Fig. 3. They consist of two cycles: The one is radiant and partakes of a thermo-electro-chemical character; the other is principally static, only inductively radiant, and mainly partakes of a physical character. Positive matter in diffusion contracts, thus causing a physical disturbance in ether (heat), this disturbance being converted into a strain to neutralize at minimum distance (electric matter), which finds equilibrium at the expense of diffusion or ionization of positive matter, thus completing a cycle. Such is the play of the forces, an unequilibrium seeking equilibrium, and finding it by producing another unequilibrium of equal value.

At the beginning of this work we assumed a creation of electric matter of specific value. We confidently believe that the created matter might be of any possible

physical form, and promiscuously thrown into the space as a solid, liquid, gaseous or ether body; or as any mixture of these which may appeal to the imagination, and yet given correct quantities, and forces as designated, it can be shown how this matter, formless and orderless, would simply by its own inherent character arrange itself into a solar system, and enter into a cyclic movement of which the present state of the solar system is a phase.

The principle of the conservation of energy has been stated thus: Energy is transformed, not created, nor annihilated. That is, the quantity of the energy of the universe is constant. We can go further and affirm that the quantity of the energy of the solar system is constant. If it were otherwise the solar system would lose its integrity as a celestial unit. If the matter of the universe was pitched into a space haphazardly the resulting solar systems would each have energy which would remain constant in quantity. The energy of the solar system forms a perpetual motion. This can only occur when the sphere of action is a cosmic unit—self-neutralizable and independently isolated. Perpetual motion is impossible as far as a fraction of a unit is concerned—say the Earth. The energy of the system in its cyclic movements meets resistance, and is expended according to the work done, but this merely means transformation, and as the action occurs within the system the energy is conserved and nothing is lost. Perpetual motion is corollary to conservation of energy, and the two must have unit fields. The perpetual motion of the solar system is sequential to the fundamental properties of matter as defined—concentrativeness of positives, diffusibility of negatives, and the mutual strain to neutralize at minimum distance and

by maximum contact. Possessing these properties moving matter seeks rest, but can only find it by setting other matter in motion. Given the properties as stated, and the quantitative relation to all space as previously defined, under no relative placement, state, or condition, can all the matter of the universe be in equilibrium at one time.

TEMPERATURE.

The conception of temperature is misleading. At the present period of the evolution of our system the Sun is the only body which is really at a high temperature. Let us explain: A thermometer consisting of a mercury column placed at the solar surface would immediately be dissolved by the absorption of heat, because the matter of the Sun is above thermic equilibrium. Now place this same column of mercury at the surface of one of the outer planets, say Neptune. It is true that the thermometer would indicate a condition similar to a high temperature, but not because the matter of the planet is above thermic equilibrium but because the lines radiating from the static forces of the Sun are so diffused that the atoms of mercury would dissociate by their intrinsic forces, and in doing so the mercury would absorb ether from the surrounding matter. Matter is only above thermic equilibrium when it intrinsically possesses sufficient contractile power to squeeze out heat, and this contractile property is only possessed by positive matter above diffusive equilibration. There was a time when planetary matter especially in the inner planets, was above this equilibrated point, and hence consolidation took place by their

inherent forces. Beyond this point they are held together by the concentrating lines emanating from the static forces of the Sun. The variation of thermic equilibrium within the solar system is best illustrated by a cometary body. It is probable that a cometary mass possesses no intrinsic contractile power, and that the changes are altogether produced by the solar forces. Hence cometary matter is constantly in thermic equilibrium. Nevertheless, as it approaches the Sun the matter contracts and radiates heat or eliminates negative gases which absorb it, and thus maintains its thermic equilibrium, until at perihelion there may be considerable consolidation. A comet is just as hot at aphelion as at perihelion, as measured by the surrounding equilibrium. Its elements become more diffused, possess more intermolecular ether, and assume conditions somewhat similar to the thermic state as it passes into the cold of space simply by its own intrinsic forces which are being relieved from the binding influences of solar lines of force. The measurement of the differential temperature of the system would require a specific meter for each planetary body.

We must first conceive that the solar system is differentially under the influence of the gravitational forces of the Sun—that matter is differentially concentrated or diffused according to the distance from the Sun. We must also conceive that the forces of diffusion produce effects simulating those of heat. It is evident that if the present heat of the solar system were entirely eliminated the Sun would solidify instantly, whilst the outer planets would remain almost in the conditions they are now. Clearly the normal or zero of temperature must be established on the basis of differential conditions resulting from solar static forces, and the variations from

the normal as being caused by solar thermic radiations. Temperature indicates the relative quantity of the intermolecular ether whose locus depends directly or indirectly on the solar thermic radiations, as shown by a meter whose zero designates the equilibrium at the specific point of the solar gravitational lines of force. Temperature denotes the intrinsic contractile potential of a substance as manifested by the concentrability of positive matter.

TIDAL AND OTHER MOTIONS.

Tidal Motion results from the differential action of the lines of force of one body, or more, on the particles of matter of another. The Sun and Moon thus act on the matter of the Earth. It is probable that the Sun's current forces neutralize to some extent his lineal forces as regards tidal action. The solar and terrestrial electric currents being in opposite direction have a repellant action on the two bodies (Fig. 7). Again the solar currents produce orbital motion by acting on the static force of the Earth. Further, the solar heat and light have a slight action on terrestrial matter. All these forces, no doubt, depreciate the tidal action of the Sun. In the case of the Moon the forces of neutralization as regards tidal action are absent. Hence the Moon's tidal action on the Earth is relatively superior to that of the Sun.

We must regard the Earth and Moon as in an equilibrated position in reference to the Sun's forces; and we must regard the Earth and Moon as in an equilibrated position in reference to each other's forces. It is thus made clear that matter on the surface of the

Earth proximate to the Sun or to the Moon is relatively more attracted than the main body. Terrestrial matter is thus disturbed. The matter on the opposite side of the Earth attempts to maintain the equilibrium, and has a tendency to move in a straight path. There are thus induced a proximate and a distal tidal action.

Tidal action has been raised in importance by being considered as a cause of loss of energy of a system—the solar system ages because of tidal action. Whether this position can be maintained by supposing a planet's orbital and axial rotatory movements as being entirely due to momentum we need not discuss. According to our deductions the circular element of a planet's orbital motion is due to the electric currents of the Sun, and the planet's orbital velocity is established and maintained by overcoming the deterrent forces. It is evident that the only way to lessen the velocities is to reduce or overcome the inductive force of the primary electric currents, or by increasing the present or establishing other deterrent forces. If tidal action in any way reduces orbital motion the planets' orbital velocities should decrease from without inwards. They decrease from within outward, Mercury having the greatest orbital velocity, although he is the oldest planet. As long as the mean distance of a planet from the Sun is maintained the inductive action of the solar electric current on a planet's motion will be constant, and there is no claim that tidal action alters the distance.

As regards axial rotation the position is different. A ball rolling on the floor has an axial rotation because the forward motion of the under surface does not overcome the friction of the floor. Throw the same ball through the air and it may not rotate, although the gravitational force is the same in both instances. It is

clear that the ball rolls because of friction and that weight is a subsidiary element, for if there were no weight there would be no friction. Now, all ponderable matter must be capable of producing more or less friction. An ether perfectly clear of ponderable lines of force is frictionless, but lines of force impart to ether the properties of ponderable matter, and the lines of force striking the surface of a planet must cause friction on a moving planet. Ether molecules joined by lines of force must require force to part them.

A ball rolling on the floor presents many elementary considerations: (1) Impulse; (2) friction; (3) weight; (4) size; and (5) configuration. Mark how the planets increase in their orbital velocities from without inwards. Neptune has a velocity of 3.4 miles per second. Mercury 23 to 35 miles per second. All facts point to a central force driving the planets. There is no break in the gradual increase because there is only one causal factor of modification, the distance from the solar primary currents. Now mark the periods of the axial rotations of the planets. Saturn and Jupiter have periods of about ten hours. Mars and the Earth of about twenty-four hours, and Venus and Mercury have no axial rotation. It is evident that orbital and axial velocities have nothing in common as regards causes. The orbital increase and the axial decrease as the Sun is approached.

In the case of planetary movements we cannot admit of any initiatory impulse as in that of a rolling ball, but the momentum is an impulse from moment to moment. Friction as regards planets accord with the intensity of the lines of force, and although it is an essential to rotatory motion it will not explain the modification of planetary rotations. That intensity of the solar lines of force is a factor in modifying orbital

velocity is exemplified by the Moon's motion. The real orbit of the Moon is round the Sun, and when relatively proximate to the Sun the solar and terrestrial lines of force by friction retard this motion. When relatively distant from the Sun the terrestrial lines of force by friction hasten the Moon's true orbital motion (Fig. 24). The Moon has no true orbital motion round the Earth.

The Earth and the Moon have orbital motions round the Sun of the same mean velocity. It is evident that lines of force emanating from the Earth owing to axial rotation move faster than the mean velocity of the Moon when the satellite is the more distant from the Sun, and slower when the satellite is the nearer to the Sun. It is thus clear that when the Moon is the external body she is riding on lines as a ball thrown on a floor which has a forward movement of greater velocity than the ball as a result of its impulse. Under such conditions the Moon cannot be expected to rotate, except, indeed, in a retrograde manner. When the Moon is the nearer to the Sun she is between two sets of lines of force which mutually neutralize as regards rotatory action.

The explanation of differential axial rotation of the planets is mainly to be found in the form or configuration of the planet. The change of configuration, however, is not due to tidal action. Mark the configuration of the outer planets. They have been shaped by the forces which produce motion and the intrinsic forces of disfiguration have not been yet brought into play. Mars is a small planet, the friction of the solar lines of force has small leverage, and hence a longer day than in the outer planets prevails. The Earth has inequality of surface in the shape of mountains, and the eastern hemisphere must be slightly heavier than the

western. Thus during the Asiatic forenoon the axial rotatory motion of the Earth must be hastened and during the afternoon it must be retarded. This variation of velocity is extended in the Moon's orbit, The inequality of surface will become more manifest by the sinking of the great Pacific Ocean, and the relative rising of the mountains, produced by the escape of ions from the poles of the Earth. The Earth will follow the lead of Venus and come to a standstill as regards axial rotation with the eastern hemisphere approximating the Sun.

CHAPTER V.

Earthquakes, Mountains and Volcanoes.

Earthquakes. Definition: Earthquakes are manifestations of unequilibrated ether (thermic waves) radiating from interior foci, which are points of neutralization of electric conduction currents from the poles of the Earth, the principal initiatory cause being periodical weakenings of the poles of the Sun, resulting from ionic slips in the form of convection currents, the neutralization of which produces co-ordinate Sun-spots.

Mountains, Volcanoes and Earthquakes are related and differ in causality as in the following definitions: Earthquakes are caused by heat traveling by conduction or as an ether mass; volcanoes by heat traveling by convection; mountains by either causal factor or by all combined. The common immediate cause of the heat is the transformation of electric energy at the points of neutralization of polar or back electric currents. The volcanic focus from which thermic radiation occurs must bear the relative position to the volcano as the seismic focus to the locus of the undulatory emergence. The heat in all instances travels in the direction and by the method of least resistance. The heat volatilizes its medium, travels by convection, and emerges accompanied by volcanic manifestations; travels by conduction and emerges as a seismic wave; or evolves as an ether mass and associated with other methods of travel elevates the rocks to the form of a mountain. However, at the locus of emergence of earthquake waves there are evidences showing how near an earthquake is to a volcano, such as openings in, and melting

of the ground along the course of the wave. Volcanoes are safety-valves whereby the transformed energy from electric leakage escapes. They are the expressions of excessive forces which have their normality in mountain building.

In Fig 7 let S represent the Sun, and E the Earth, and let the arrows A indicate the energy, as heat and light emerging from the solar and incident to the terrestrial body. Consider this energy as molecular ether out of equilibrium moving by displacement—ether set free from molecular fields, or nascent by electric neutralization, at the solar fountain of energy, and creating a radiation-pressure on the Earth's surface. Relative to this subject our *first deduction* is that ether unequilibrated, as solar energy, creates a radiation-pressure at the surface of the terrestrial body.

When the locus of a radiation-pressure is between two points which are the seats of differential free forces the energy is transformed into electricity. This law is universally coincident with the creation of electric force. The essentiality of the law is that molecular ether is chemically dissociated into atoms, when moving under resistance as heat or light, and under the influence of free forces qualitatively different. If we mentally grasp the fundamental element of the law we will at once see that the Earth as a polar body possesses the difference of potentials essential to the transformation of heat and light into electric currents or charges. Moreover, the demonstrable electric currents of the Earth are proof of the correctness of our conception. The terrestrial magneto-electrolyte is presented to the heat and light energy emanating from the Sun, converts part of this energy into electric currents, which passes to its poles and charges them, the north pole negatively

and the south pole positively. When the Earth is regarded as a polar body with differential ponderable polar forces, the north having a free force of cation quality and the south a free force of anion quality, thus being similar in the distribution of its constituents as a body placed between electric poles, it will be apparent that the positive current seeking the terrestrial south and the negative seeking the terrestrial north, is electric matter and ponderable matter seeking equilibrium by mutual neutralization. The terrestrial polar body is presented to solar energy (the pressure of unequilibrated ether) and transforms part of this energy into electricity (chemically dissociates the ether into electric matter), which differentially charges the poles. This is our *second deduction*. (Fig. 7B).

What becomes of the terrestrial polar charges? They neutralize in the direction of least resistance. We have two paths to consider: (1) The normal or interstellar path, from the poles of the Earth to the poles of the Sun; (2) the back, earthquake, mountain building, or terrestrial path, from the poles of the Earth equatorialwise. The former is a distance of about ninety-two million miles and the latter about eight thousand miles. But distance indicates only one element of electric resistance, an element which may be overcome by the quality of the medium. Electricity travels miles along a copper wire when a matter of a few inches of insulation separates the currents. The facts of electrified partial vacua show that as ponderable pressure decreases the electric resistance decreases, and the current increases up to a critical point, when there are no more ions to charge. Again we must consider the important factor that the poles of the Sun possess attraction for the electric charges of our planet. A careful study of electricity convinces one that it is

selective as chemical action is selective. We will show that the north pole of the Sun possesses particular attraction for negative charges, and the south pole for positive charges, which is merely analogous to the selective action of ponderable elements, and shows that electric matter obeys chemical laws.

It is acknowledged that the Sun is a polar body. What does this polarity mean? Not that it is simply a magnet, but an immense electrolyte (perhaps a magneto-electrolyte), constituted of more positive ions than negative at its positive or north pole, and more negative ions than positive at its negative or south pole. Mark: The immense positive free force of the north pole of the Sun takes the negative electric charge from the north pole of the Earth just as a strong metal as potassium takes oxygen from hydrogen; and the immense negative free force of the south pole of the Sun takes the positive charge from the south pole of the Earth just as oxygen takes hydrogen from carbon (Fig. 7).

What is the character of the currents which flow from the poles of the Earth to those of the Sun? Undoubtedly they are convective, and are probably the same as alpha and beta energy of radio-active substances. Alpha particles positively charged emanating from the south pole of the Earth are deposited on the south pole of the Sun, and beta particles negatively charged emanating from the north pole of the Earth are deposited on the north pole of the Sun. Convective electric currents leave the poles of the Earth (manifesting as aurora polaris (Fig. 9), and enter the solar body at its poles. This is our *third deduction*. (Fig. 7DC.)

By deduction let us formulate a concept of the solar body: (1) A mass which as a whole is positive in quality; from which it follows (2) that it has a center possessing the property of electric conductivity; (3) an electrolytic body with its ponderable positive pole pointing northward and its ponderable negative pole southward. A body of water (this substance is cation in quality) placed between strong electric poles is electrolytically representative of the solar body. The water electrolyte (Fig. 11) when examined is found to have free oxygen at one pole and free hydrogen at the other. The Sun may have a crystalline structure, like that of the Earth, at his center, but it is more likely to be metallic. The temperature of the central Sun is not necessarily high.

We have said that negatively charged ions are deposited at the solar north pole, and positively charged ions are deposited at the solar south pole. What becomes of these electric charges and of the ions which are charged? If we study the arc-light (Fig. 8) we will see that we have a miniature picture of the electric energy passing from the south pole of the Earth to the south of the Sun. It can be demonstrated that in the arc-light (Fig. 8) positively charged ions pass through the interspace, that the ions are deposited on the negative pole, and that the current passes onward. This indicates what takes place at the poles of the Sun—the ions are there deposited and the electric charges pass onward by conduction and neutralize within the equatorial regions. The celestial pathway between the poles of the Sun and those of the Earth are vacua through which great arcs of energy (convective currents) pass; and ions are deposited at the solar poles just as they are deposited at the cathode of the arc-light.

The polar charges passing by conduction through the central Sun and neutralizing in the equatorial areas are transformed into the heat and light which emanate from that body. This is our *fourth deduction*. (Fig. 7GH).

This energy, emanating from the solar equatorial region, radiates along the solar equatorial plane (approximately the plane of the ecliptic), and is returned to the Sun as electric energy. The Sun gathers electric energy and converts it into heat and light; the planets take up the heat and light and convert their energy into electricity. The Sun is a primary electrolyte (Fig. 11); the Earth is a magneto-electrolyte; the Sun absorbs energy at its poles and emits energy at its equator; the Earth absorbs energy at its equator and emits it at its poles. The equatorial plane of the solar-planetary space is filled with a stream of energy of heat and light emanating from its solar center; the polar regions of the space are filled with electrified ions emanating from the poles of the planets, radiating sunward, and concentrating at the solar poles; and so the cycle is complete. But, mark, with the absorption of energy the Sun gains ponderable matter, and this fact is indicative of a *greater cycle*. It will be seen that the Earth and Sun constitute a system in the form of a galvanic circuit (Fig. 7), the Earth being a thermo-electric cell—the Earth receives energy as heat and light from the Sun and passes it back to that body as electricity.

It must be distinctly remembered that in the solar-terrestrial thermo-electric circuit ions accumulate at the poles of the Sun—cations at the north and anions at the south. In the common processes of electrolysis, occurring in a galvanic circuit, a similar accumulation

of ions at the poles of an electrolyte may be so great as to obstruct the primary current, and be sufficient to create a reversal called the *polarized* current. When the ionic accumulations at the solar poles reach certain maximum potencies they break loose as convective currents, chemically synthesize, and their energy is transformed into heat with tremendous effect in the equatorial regions of the Sun (Fig. 7NP). The ether set free by the transformation of energy causes the Sun-spots (Fig. 10). It is clear that the loosening of these great embankments of ions will (1) weaken the polar forces of the Sun, and (2) will intensify the thermic energy radiating from that body. Mark the effect of these solar conditions on the Earth: (1) The Sun's poles being weakened, the attraction will be less for the electric charges of the poles of the Earth; and (2) the solar heat being increased, the poles of the Earth will be more fully charged. What is the result? The terrestrial polar charges are mutually attracted and neutralize within the terrestrial body; and the point of transformation of the energy becomes the seismic focus. At the focal point the reversed currents from the poles of the Earth are transformed into heat, and the course of the thermic energy marks the undulations of the seismic disturbance (Fig. 7FF). The earthquake is a thermic wave resulting from electric transmutation, the electric energy being polarized or reversed currents within the terrestrial body, and the initial points of disturbance being at the solar poles. This is the *fifth deduction*, and is the summation of our argument.

Let us consider the conditions which must obtain in the interior of the Earth. Let us apply our imaginative powers to the cyclic period in the history of our solar system when the ponderable matter within the

solar planetary space was nebulous in character; when, according to Kant, Laplace, and Herschel, gaseous matter in rotary motion was evolved by a special creative act. But, in our interpretations let our conclusions be deductive, ever remembering that our hypothesis is our guide and arbiter. Then from the nebulous period onward we may trace the evolution of our planet to our present condition; or, commencing at our present period we may trace it still onward, until it again becomes nebulous, having lost its planetary identity in the general absorption of the system by the Sun (the Greater Cycle); but at no evolutionary phase can we deduce a solid crust on an interior, or on any part of an interior, which is molten. Our Earth is solid as the rock to its very core. The gaseous matter must have condensed by the formation of a solid nucleus which grew by accretion, or by uniting with other nuclei, until the present proportions were attained. This will lead to the conclusion that the interior of the Earth is solid, and the deeper the more dense it becomes, until a critical point is reached, when maximum condensation obtains.

We see liquid matter belched from a crater, we see heated water boiling from springs, we sink our shafts and the heat perhaps increases with the depth; but these and other relative phenomena can be explained on the same basis as earthquakes are explained—manifestation of thermic action from transformation of back electric currents.

Suppose that the seismic focus is at a point ten miles from the Earth's surface (Fig. 7F), and that is where electric transformation occurs; and say that it covers an area of one mile in extent. Then from this area tremendous waves of heat will be initiated which will

radiate in the direction of least resistance, will follow the media of greatest thermic conductivity, and the undulations will spread until the terrestrial surface is reached. A wave will consist of two phases: (1) a dilating process of the constituent particles; and (2) a contracting process of the particles. The dilation is caused by the ether as heat entering the molecular systems, and the contraction is caused by the molecular attraction reasserting itself. Such is the *seismic wave*. The first effect, however, of the nascent molecular ether may be a physical blow dealt so quickly that ponderable molecules individually cannot respond. In virtue of its impenetrability and imponderability the ether lifts and cuts its way through the solid ground. This will constitute the maximum of intensity or primary shock. As the pressure is modified the ether as heat radiates through the molecular systems as secondary waves; the whole constituting a seismic series. As the ether rushes through the atmosphere it produces sound.

It is obvious, as the initial fault in the electric system of our solar planetary space is situated at the poles of the central body, the Sun, that earthquakes may be considered present in any part of the solar system. The spots on the surface of Jupiter indicate seismic and volcanic activity of the great planet. However, the great spot of Jupiter may be primary or solar in character, as the author has explained in a previous work. More probably it is a satellite captured and resting on his surface. No doubt many conditions may determine the locus of the disturbance. The position of the planets in relation to the Earth may be a determining factor by neutralizing the polar energy of the Sun, thus unloosening the polar energies of the Earth. The same may be said in regard to our Moon. The time of day

may determine the meridian of seismic activity. However, the potent factor must be the breaking loose of the mighty embankments of ions piled up at the poles of the Sun through years of electric activity of the solar system.

On the morning of April 18th, 1906, at 5:13 o'clock, the great earthquake shook Central California. The Sun was at its zenith at 20° west longitude from Greenwich. Probably the most effective time of day for the transformation of thermic into electric energy is from 1 to 3 P. M., as at this time the Sun's rays reach the greatest depth in the crust of the Earth. Thus we may consider the longitude of Greenwich as indicating the region of maximum transformation of solar into electric energy at the time of the California shock. We must view the Earth as a whole, a polar body. Imagine the solar rays incident to the continents of Europe and Africa (while California sleepeth) transformed into electric currents seeking the poles of the Earth and thence the poles of the Sun. The electric energy is flowing intensely, and at the terrestrial poles electric potentials are accumulating, but the solar poles are holding fast the terrestrial polar charges. The solar body is pouring its energy earthwards, but it is equal to the occasion and holds the Earth in equilibrium as a needle is held when presented to a magnet. But, mark, ionic accumulations of years at the poles of the central body are moving from their positions as in the reversed or polar movements of an electrolyte. The disturbances become more pronounced, the ionic mountains move from their fastnesses, slowly at first but with increasing velocity, and the ions pierce the Sun's mass with a force which, in velocity, ponderable dimensions, and magnitude, is unequaled in celestial

phenomena. It is a battle between the anions and cations, with total extinction of both, and the battle-field is marked by a hole in the Sun which can be viewed from our planet's surface (Fig. 10). We can only compare the crash to impossibilities: Let us mentally picture two comets from opposite directions and of different chemical qualities meeting in space, or two planets of opposite cyclic movements rushing together; and by a play of the imagination we may thus conceive of the tremendous force which effects cavities in the Sun's mass equal in dimensions to the size of the Earth.

The immense pressure at the center of the solar body must bring matter to its maximum density. The law of the distribution of positive and negative matter must cause the solar center to be cation or metallic in quality. This center then is a conductor of electricity. Now mark the building up of the cathode in an arc light (Fig. 8), and we can conceive how the accession of ions will build up the poles of the Sun both in matter and in force. It is easily seen that this accession will reach a maximum. But a simple landslip from the solar poles will not produce the sequential manifestations. What must take place is about as follows: Although ions are essential to a convection current it does not follow that a mass made up of ionic deposits is a good conductor of electricity. It is reasonable to suppose that such a mass possesses the relative conductivity to that of the center of the solar body as the conductive property of an element such as potassium is to that of silver or copper. Then (1) the accumulated ions will increase the resistance to electric conduction, and will in consequence retain their charges. This will decrease the heat radiating from the Sun, and will

in a degree lessen the attraction of the solar poles for terrestrial charges. As the charged ions accumulate they will lose their equilibrium, and then (2) the slip will occur, which, being charged matter, will eventuate as convection currents. The conditions must be exactly similar at both poles. The convection currents will pass through the solar mass more superficially than do the conduction currents. The electric matter, however, of the conduction currents and that of the convection currents are the same in direction, the essential difference being that the ions constituting the convection currents, which under solar pressure must be larger in mass than those received from the planetary poles, are lost to the poles of the Sun, which in consequence have decreased in difference of potential.

The movement of ponderable matter from the poles of the Sun is partially equilibrated by a movement of electric matter from the poles of the Earth. Positive ions from the north meet the negative ions from the south pole of the Sun; and negative electric matter from the north meet positive electric matter from the south pole of the Earth. The former cause a sun-spot, and the latter an earthquake, or manifests as a volcano. We are living between charged poles and the earthquake is caused by a slip or leakage of electric matter, and is the thunder and lightning of a solid medium. Nature deals in immensities, and her celestial unit is a solar system, but she is exact in her laws, whether the object is a thermo-electric cell made up of planetary bodies, or a simple galvanic battery artificially constructed. Hence the disturbances occurring in the former are diminutively portrayed in the latter.

We are convinced that the earthquake question is mainly astronomical. We believe that on the basis of

our hypothesis every relative fact is placeable in its appropriate position as each element of an architectural puzzle is fitted to its position. The solar planetary space is the unit plot on which the great Architect builds. No phenomenon occurring in any part of this space can be understood except by considering its relation to the whole space.

The "earthquake crack" of California is between three and four hundred miles in length, and its course is remarkably straight, cutting across mountains of considerable magnitude. The average horizontal displacement by the earthquake of 1906 is given as about ten feet. It is easily conceivable that an immense quantity of heat instantly generated at the focus, taking the general direction of least resistance, would *break the back* of the mass above it in a straight line independently of all particular structural differentiation. It must ever be remembered that heat is a manifestation of moving ether, a substance endowed with the property of impenetrability, hence the earthquake rift is a parting of the rocks to allow this substance to pass to a position of equilibrium. That heat will part ponderable matter in such a way can be demonstrated by laboratory experimentation. Molar as well as molecular separation is effected by heat. The length of the earthquake rift depends on the length of the *focal area* (area of electric transformation), and the displacement on the intensity of force, or the amount of ether radiating. It is conceivable that the electric and thermic conductivities of the mass of the Earth are such that seismic waves will repeatedly and selectively follow the same routes.

Mountains. That the Earth has the property of electric conductivity is beyond question. Undoubtedly

its parts have differential conductivity. The question is pertinent: What geological structure will an electric current select as a medium in passing from the equator to either pole? In answering this question we must consider the varied character of the stratified crust, and (it may be presumed) the almost homogeneous character of the unstratified rocks. We have also to consider that metals are the best conductors although closely approached by saline solutions. But it is evident that these will lack continuity when placed within the stratified crust. For a great distance an electric current undoubtedly selects a path through unstratified rocks as against one through stratified. In relation to this question we must conceive that by the process of primary condensation the metals may be intimately mixed, although not chemically united with the unstratified rocks.

Then what part of the unstratified formation of the Earth does the current select? Here the factor of density is to be considered. Density to a certain maximum promotes electric conduction. It is conceivable that the extreme density of the center of the Earth promotes electric resistance, and that an electric current finds a path of least resistance near the circumference of the unstratified formation. Here we arrive at the essential element of the question as to how mountains are formed. Back electric currents from the terrestrial poles must be transformed into heat in the circumferential portion of the unstratified rocks of the Earth. The tremendous heat generated will raise the granitic rocks to the surface. It is evident that the height of the mountain resulting from this action will be directly proportional to the thickness of the stratified deposit above the point of transformation. Hence

geologists find evidence of mountains being once margins of former oceans into which rivers were emptied, and that mountain ranges before upheaval were lines of exceptionally thick sediments; and hence they find evidence of primary or unstratified formations at the top of mountains.

If the neutralization point of the currents be deeper than the circumference of the unstratified rocks then the heat will travel by conduction until the circumference is reached, and owing to a change in the thermic resistance from this point to the surface of the earth the heat will travel by convection. In any case unstratified rock will be brought to the surface, uplifting and breaking through the stratified portion. It will be seen that mountain building may fall short of volcanic action inasmuch as the erupted materials are not spread over the surface.

Volcanoes. Volcanic eruptions are composed of two classes of rocks—acidic and basic. It is clear that the primary rocks have been chemically dissociated by an extraneous force, the original material undoubtedly being a chemical combination of the acidic and basic integrants. Heat was absorbed during the process of production of the rocks, the action being analytic. If the heat had been produced by chemical action a neutral resultant would be found in the eruptions. Hence we cannot absolutely define the character of the rocks of the interior of the Earth by that of the unstratified rocks on the surface, these having undergone a chemical change by the heat which elevated them. We cannot therefore value the conductive property of the interior of the Earth by that of the unstratified material on the surface. However, the indications are that the rocks of the interior are crystalline, and there-

fore solid, that they are chemical combinations of the acidic, and basic eruptions, and that they are finely permeated with metallic concentration.

A theory particular in its application, has been advanced that water coming in contact with heated rock of the interior is the cause of eruptions. The facts do not uphold this theory. Water coming in contact with heated rock would cool and consolidate the rock, by absorbing heat. Whereas the ejected rocks bear evidence of being the products of a chemical dissociation by heat. Heat has been initially imparted to them, not withdrawn from them. The evidence shows that the water accompanying the eruption belongs to the stratified crust, and that it has incidently absorbed heat as an element of the crust at the expense of the true volcanic material, after volatilization has occurred.

Mountains, volcanoes and earthquakes have a common origin inasmuch as they are caused by heat produced by neutralization of polar electric currents. There are, however, changes taking place in the Earth's crust of a more gradual character and an even more extensive one than mountain building. Perhaps whole continents are being slowly and imperceptibly lowered or elevated, taking the sea level as a standard of measurement. An area of 10,000,000 square miles in the mid Pacific has sunk 10,000 feet within a comparatively recent geological period. Other parts have been relatively elevated. How shall we account for these oscillations? Simply by an electrolytic readjustment of the constituent elements of Earth consequent to the escape of electrified ions from its poles (Fig. 7CD).

The cations issuing from the north pole must modify the unstratified interior, which will undergo a continual process of contraction followed by a falling in of the

crust. If the part sinking be below the ocean the sea level will also fall, and thus relatively certain parts will be elevated. The planet Earth is unmistakably a contracting body; and what the planet loses the solar body gains.

Chaining an Earthquake. The energies stored in the terrestrial mass as coal, oil, etc., must at some time be exhausted. The currents of water of the Earth will indefinitely furnish energy convertible into electricity. This will hardly suffice for the uses of man. The principles underlying the conservation of energy teaches us that energy is never lost. The energy of the Solar System is constant in amount. Can the energy that drives the Solar System be tapped? Can the energy which manifests as an earthquake be chained and made to obey the will of man? We answer these questions affirmatively. Metal plates placed at or near the poles of the Earth and properly connected with the interior will be electrically charged. A conducting wire connecting the north and south polar charges would tap the motor energy of the Solar System and furnish heat and light and potential force for every purpose that the human mind can devise. The only essential quality of the conducting wire would be that it possess less resistance to current electricity than the medium between the Sun and Earth.

The Shape of the Earth. The Earth is oval with the larger end pointing northward. This was the terrestrial form when the planet was transformed from cometary conditions. There are, however, active forces which constantly modify its form. Mark the changes taking place at the poles of an arc light. Observe that the anode is hollowed out and the cathode is built up. An ion is torn off by the current from the anode and

deposited on the cathode. Now analyze the changes produced by the forces at work at the poles of the Earth as portrayed in Fig. 7. At the north an electrified positive ion escapes to the Sun. This must be taken from the solid or positive matter of the Earth. Consequently the pole is hollowed out as the anode of the arc light is hollowed. At the south pole of the Earth a negative ion escapes to the Sun. It is reasonable to conclude that this negative ion is torn by the electric current from the oxygen molecule of the atmosphere and that the residual ion is positive in character. A disturbance is thus produced favorable to condensation and building up the south pole in a similar manner to the building up the cathode of an arc light.

The positive ions, however, may not altogether come from the matter proximate to the north pole but may by electrolytic action seek that pole from the interior of the terrestrial mass. The positive character of the interior will favor an ionic stream towards the north and will not favor such action towards the south pole.

The author has previously published his conclusions in reference to the terrestrial poles, but lately a remarkable confirmation of his views has been made in Arctic and Antarctic explorations. The North pole is surrounded by water and the South is found at a height of 10,000 feet above sea level. Truly the anode and cathode of an arc light represent respectively the north and south poles of the Earth.

It is conclusive that all bodies, large or small, within a solar system, with the exception of the central or solar body, assume at their formative stage the oval form, and that this form in the case of planets is maintained by processes of cyclic energy. The Sun is globular.

CHAPTER VI.

The Cyclic Periods of Planetary Evolution.

The cyclic manifestations of planetary conditions involve the following forces:

Those of Concentrability: (1) Attraction₁ between cation elements, by the predominance of which the metallic elements are the products—elements whose molecules possess positive free forces. (2) Neutralization between cations and anions (under pressure) productive of such rocks as the primary, granitic or crystalline order, whose molecules possess constituents which are self neutralizable. (3) Concentrating influences of the static¹ forces of the Sun on proximate bodies (a blanket of concentrating lines of forces emanating from the Sun envelops the system), particularly manifested in a comet as it approaches the Sun. As the solar body increases in mass and in static force it increasingly dominates the planets by condensing the positive elements and driving off the chemically free negative elements, the latter seeking an equilibrium in a common atmosphere (Fig. 6).

Those of Diffusibility: (1) Repulsion between anion elements, the fundamental principle which maintains matter in atmosphere (Fig. 3). (2) The tendency of the forces of matter to neutralize at minimum distance. All matter strains to reach free cathode particles, and incidentally anode particles. (3) Electric convection currents, as in ionization of matter and its conveyance from the poles of the planets to the poles of the Sun. (4) Heat produced at the point of neutral-

ization of electric currents, as in the case of the currents of the Sun (Fig. 7). The local action of this heat keeps the solar body in a state of ionization. (5) Solar radiations. As the solar body increases in electric and thermic activities radiant energies volatilize solid matter, thus positive elements of the planetary body invade the atmosphere of the planet.

We can divide planetary life into four periods:

1. *The Period of Nebulae.* The extreme outer planets have lately evolved from this period. Beyond these there must exist (although not entirely demonstrable owing to its anion quality) a band of matter from which planets may be condensed. The intrinsic forces of a planetary body are in equilibrium at a stage of evolution which is progressive directly proportional to the degree of dominance of the Sun. Having reached an equilibrium the intrinsic forces of a planet resist the concentrating forces of the Sun. Each planet has its particular physical state which accords with the equilibrium of its forces. Mercury is in equilibrium as a solid body, Neptune as a diffused body. A real nebulous condition, however, differs from the state of Neptune and from the state of the common atmosphere. The energy of the solar system at present is stored principally in the Sun, and is an expression of the ionization of positive matter. A solar system in a nebulous state is all Sun—less his radiant energies—its positive matter being ionized by processes now going on in our system. In real nebulosity energy is stored, in the diffuse state of Neptune or in that of any negative mass no energy is stored. It follows that the term nebulous can only be applied to a general state of matter of a system and not to any particular part of a system. It is not strictly applicable to any part of

the solar system, except we apply it to the surface matter of the Sun. Undoubtedly from the true nebulous state a planetary nucleus is formed by intrinsic condensing properties of the matter involved. The condensing forces, however, become exhausted and an equilibrium is established. Hence condensation depends on the Sun's forces.

2. *The Period of Primary or Unstratified Rocks.*

The primary condensation processes are molecular in character—molecule by molecule as in the growth of a crystal. The molecules of the metals form in the atmosphere and join the solid formation by accretion. The neutral molecules of the rocks form at the moment of precipitation from cation and anion gaseous elements. The results of the forces named as those of concentrability are a neutral rock substance molecularly permeated with metallic elements. However, the interior of a planet must be differentiated and to some extent stratified, as the more positive materials will condense first, perhaps the center of a planet is a metallic core. In the formation of crystalline rock it is essential that the molecular constituent should be neutral and a polarizable quantity. Within the substance the molecule will have poles, and the crystalline mass will have poles. The conception forcibly presents that at the moment of solidification the poles of the crystallizing molecules will assume a common direction—the delicate balance of the molecules as they solidify will allow the positive poles to be attracted northward and the negatives poles to be attracted southward. This will allow us to formulate a concept of the Earth's magnetic and electrolytic polarities. The form and mode of condensation of the Earth gives it a diffuse polarity extending almost to the equator, but intensified at its geographical

poles. Intermixed with the polarizing molecules are those of the metals, conditionally non-polarizable and of cation quality. These together with the non-polarizable anion elements solid and gaseous give the Earth its electrolytic qualities. The concept matures and formulates as follows: The Earth is a *magneto-electrolyte*, and this term also applies to the other planets.

The ponderable elements of the Earth assume their polarities in response to the inductive influence of the electric currents of the Sun, and initially to the influence of cosmic and solar static forces. After the nucleus of the planet has been formed the direction of the polarity of the crystallizing molecules will be influenced by the polarity of the nucleus. It is obvious that the mass of the Earth has a free force by virtue of its cation or metallic elements; that its electrolytic character is derived from the polar placement of its cation and anion elements; and its magnetic character from its crystalline rocks. The distribution of the polarities of the Earth accounts for the phenomena of auroras which, induced by intense solar disturbance, manifest to within 18° of its equator. Economy in the travel of force in the cycle of energy between the Sun and planets demands a common direction of polarity in the Solar System. Energy selects and shapes its agents so as to economize its efforts. This is the law of selection of least resistance.

During this period water, if it exist at all, remains in the atmosphere. The atmosphere is impure containing such elements as hydrogen, carbo-hydrides, and carbon monoxide. The oxidation of the hydrogen is the process by which water is primarily formed, and the exciting cause of the formation may have been electric storms. The polar electric currents neutralize near

the surface of solid matter, and produce only slight elevations, there being no mountains, the planetary surface being one vast plain. The liquid form of matter does not exist, at least not in the beginning of the the period. Matter crystallizes and forms the primary order of rocks directly from the gaseous state, or becomes solid by positive concentrativeness and forms the metals. We see the processes manifested in a cometary body as it approaches the Sun. There is no suspicion of a liquid constituent in a comet. Jupiter is the best exponent of this stage of evolution. Mars has taken one step beyond it.

The conception is general that during this period matter is at high temperature. This is not necessarily the case, as matter may be gaseous without being hot. The term temperature is misleading when relatively applied to planetary bodies. A thermometer would necessarily have to be specifically constructed for each planet. The Sun is at a high temperature because electric energy is constantly being transformed into heat within his body, thus keeping matter above the equilibrium. Our atmosphere is not at a high temperature, and we may conclude that cometary matter is not. However, the condensation of our atmosphere would evolve heat. A high temperature therefore implies a state of matter above the equilibrium. A solid material on the Earth requiring extreme heat to sublime may equilibrate as a vapor on Neptune because of the modified influence of the static forces of the Sun. It vaporizes on Neptune by intrinsic dissociating force and not from heat. A body is at a high temperature when it is capable of condensing by its intrinsic forces, and this quality exclusively belongs to cation matter.

3. *The Period of Stratified Rock.* Oxygen and hydrogen have united and form water during this period. Climatically there are two mountains present, the north and south polar regions. Water in the atmosphere first, and afterwards on the surface of the planet, becomes heated at the equator, as water-vapor, seeks the winter pole, and is there condensed as snows. Seasonal change melts the snow and the first rivers are formed. These tear asunder the polar unstratified formations, carry them southward or northward as the case may be, and deposit their loads in the beds of oceans which the water of the rivers form, thus initiating the archæan system of rocks. *The archæozoic era is thus ushered in sequential to conditions in which the water molecule is in equilibrium, and concurrent with physical conditions which permit a water cycle.*

Mars is evidently passing through the archæozoic era. His seasonal snow caps from which emerge the extraordinary system of canals distributed almost over the whole planet, the vast colored areas also seasonal, and a mountainless surface, are phenomena which indicate the archæan period as being the present stage of Martian evolution. Moreover Mars occupies a position in the solar system which denotes a later development than that of the Earth.

Geologists state that there is an absolute unconformity between the archæan system and every other system of rocks. They observe a universal break between the archæan and palæozoic systems, giving rise to the conception of a *lost interval*. During this time great changes occurred in physical geography and climate. What happened? The archæan rocks are very extensive and of enormous thickness—40,000 feet in Canada. It is evident that the opportunity is here presented for

mountain building. Polar currents neutralizing and transforming into heat in the unstratified formations below this mass of archæan rocks must find vent at the surface of the Earth. Hence a mountain is born from mother Earth. The significance of this event is at once apparent. It is revolutionary. The water vapor of the atmosphere is condensed at the mountain top within the temperate zone, new rivers with different directions spring up, and latitudes that previously were barren become green with flora, quickly to be followed by corresponding fauna. The areas covered with archæan rocks where vegetation had previously commenced became a desert because of the change of water courses, and the surfaces of the rocks became eroded by long exposure. The cycle of the water systems had changed, and the *palæozoic era was evolved with the birth of a mountain.*

4. *The Period of Disintegration.* A planet ages like the human body by becoming relatively more positive in its constituent elements. It is a process of cationization.

The tail or atmosphere of a comet is always the more distant part from the Sun. It would be the same with the Earth's atmosphere if it were not for the planet's daily rotation. The Moon's atmosphere is on the opposite side of that body. The relative position of a comet's tail means that its more negative constituents tend to escape, and some of them do escape, as that body approaches the center of the solar system.

From a study of the behavior of comets we derive two lessons: 1. That negative matter in equilibrium has a certain quantitative maximum which decreases as the body approaches the Sun. 2. That positive matter concentrates as the body approaches the Sun, the solidifica-

tion occurring directly from the gaseous state. Condensation is effected by the influence of solar static force; whilst thermic radiations have diffusive effects.

Now although a planet does not rush toward the Sun with the speed of a comet, yet there is approachment between the solar and planetary bodies. The Sun is a growing body and its surface thus approaches the planets. Again its enlargement gives it more force which is equal to approximation. Further the increase of solar force will drive off the negative elements of the planets, thus making these bodies relatively more positive, which will then equilibrate nearer to the solar body. Thus their orbits must be undergoing a slow process of contraction.

We can now formulate our deductions as how a planet dies. This is best done by comparing Venus with the Earth, although in this the scarcity of facts relative to the former will in a measure hamper us. Astronomers have observed on Venus irregularities of surface which they have concluded to be mountains of very great altitude. Schroeter assigned a height of 25 to 30 miles to those near the *south* pole of the planet. This assignment of altitudes is supposed to be extravagant. It has been concluded by observers that the atmosphere of Venus is from one and a half to two times as extensive and as dense as that of the Earth, and having an actual height of about 55 miles. Its albedo is three times that of the Moon, four times that of Mercury, and is exceeded by Jupiter and Uranus. This high reflecting power has been accepted by some as evidence of clouds in its atmosphere, but by others it is considered to be too high for cloud reflection.

Let us see what changes will be made by the Earth in its course toward the conditions of Venus as indi-

cated by relative facts. It is conclusive that the escape of electrified cations from the north pole of the Earth—cations seek this pole by electrolysis from the terrestrial center—will contract the unstratified area and allow the bottom of the sea to sink, and thus lower the sea level. Obviously mountains must increase in relative altitude. As the Sun increases in dimensions and radiant power there will be more water vapor and less water liquid on our planet. Further water is continuously being absorbed by organic matter, thus lessening the quantity of the liquid variety, and some of it may be left as snow on the tops of the mountains as they increase in height. Furthermore the negative ions escaping as a convection current from the south pole deprive hydrogen of its companion, and thus hydrogen will accumulate in the top atmosphere. Again oxygen being chipped to form a negative ion the residual cation precipitated will build up the south pole, hence the high mountains in this region of Venus. Our Earth has already commenced south polar mountain building, and a corresponding hollowing of the north polar region.

Thus it is easily seen that our mountains will gradually assume a tremendous relative height and that the Earth will partially and even wholly lose its water. Truly the observation of Schroeter does not imply an extravagant condition for even a hundred miles is not an excessive estimate of the altitude to be attained by mountains on a planet having an 8,000-mile diameter.

As the solar and terrestrial bodies approximate and the former gains more gravitational power over the latter a negative or anion atmosphere will lose its equilibrium. The negative elements will gradually be replaced by positive elements volatilized chiefly by the

heat of the Sun. This process of cationization of the atmosphere will render it less transparent and more extensive than at present, but will in the end force animal and vegetable life to become extinct. When the planet is still more under the influence of the Sun its positive atmosphere may join the solar body, becoming part of its chromosphere.

The albedo of Venus is about equal to that of Jupiter. This would indicate similar densities of their atmospheres. The forces active in Jupiter (solar gravitational forces) have not yet separated the positive gases from the negative—the air has still to be purified by further condensation of positive matter. The forces active in Venus (solar thermic radiations) have volatilized positive matter which is displacing the negative—the air is being vitiated and the period in which vitalizing processes are in equilibrium is passing. Clearly with negative gases passing from its atmosphere the breath of life is literally leaving Venus; and as for Mercury it is but a cationized cinder.

There is this consideration, however, in reference to Venus. The cationization of an atmosphere will commence at its top, the volatilized positive elements such as hydrogen being lighter than the negative oxygen and nitrogen, and not until the process is well advanced will it affect cell life on the planet. This process may have already been initiated in the Earth's atmosphere. Venus with high mountains, and high albedo may have as temperate a climate as the Earth, and although having a less amount of water than the Earth the water cycles may be more direct and shorter, and therefore more available for the production of organic matter. Nevertheless Venus is approaching or has already attained the critical period when the essential conditions

for the production of the organic cell no longer prevail.

The process of cationization characterizes the whole life of a planet, which is mainly accomplished by solar force driving off anion matter. During the first two periods the planet is built up by solidification of atmospheric elements, a process which ends when the atmosphere is cleared of cation gases. As electrified particles both anions and cations escape to the Sun, while anions are also eliminated by the concentrating influence of that body. Thus disintegration of planets proceed by the escape of both anions and cations.

PERIOD OF CELL LIFE—THE WATER PERIOD.

Within the solar system the psychozoic era is fully attainable apparently in one planet at a time. Commencing with the innermost planet when the Sun's energy is relatively small, and when the system is just evolving from the nebulous period of its cycle, the length of this era must be directly proportional to the planet's distance from the Sun. As the era progresses outward, step by step, from planet to planet, its length increases, the size of the planet being a factor of but slight importance in directing its evolution. Then, what are the conditions essential to the evolution and surface distribution of the vegetable and animal cell? The answer is as follows:

1. A common boundary (1) between solid and gaseous matter; (2) between positive and negative matter; and (3) demarcating a surface at which the radiant

energies of the Sun are localized owing to increased resistance.

2. Water.
3. Mountains.
4. Axial rotation.

The common boundary line undoubtedly exists on Mars, and perhaps on Venus. On these also the known facts favor the¹ existence of water. The presence of the common boundary renders it possible for an animal resting on a solid to breathe an atmosphere which is purely negative. At the common boundary line radiant energy is localized at a point where a synthesis is possible involving both positive and negative elements, the result being the organic molecule so differentiated from other molecules as to be supposed by some to call for a special creation. The concentrating influence of the gravitational forces of the Sun and of those of the planet on the one hand, and the diffusing forces of matter (repulsion between negative entities, the strain in positive matter to neutralize by maximum contact, and incident radiant energy) on the other hand, effect a balance of force which reaches its acme at the relative position which the planet Earth now occupies in the solar system. Concurrently with the advent of the common boundary line the same forces unite in producing another essential to cell-life, the water-molecule.

Axial rotation may not be absolutely essential to cell-life, but its absence certainly limits the sphere of cell activity. The same can be said of mountains. Without them the water cycle must be limited as in the case of Mars.

On one side of the boundary line is an atmosphere of almost purely negative elements presenting but slight

resistance to radiant energies, heat and light; and on the other side is matter of a positive solid presenting great resistance to radiant energy. Then there is essentially present a substance of such delicate potencies as to pass readily from the solid to the gaseous and to form an intermediate liquid state. The molecule of the intermediate substance, water, of slight positive free force, at the boundary line of the physical states of matter forms a nucleus round which positive and negative molecules or atoms are incorporated into one molecule or cell, the unit of organic life, and which is differentiated according to the radiation pressure. The essential elements to the presence of cell-life on a planet is the water molecule, and a distinct physical line of demarcation at the planet's surface between negative and positive matter where radiant energy is stayed and transformed. The solar radiations transmitted by the atmosphere reach the point of resistance where the energy is localized and transformed, and one of the results of transformation is the cell-molecule. In the outer planets positive matter has not sufficiently condensed and exists in the atmosphere, in the extreme inner planets positive matter has again crossed the boundary line, being volatilized by solar heat. In the outer planets the chemical elements of water remain apart to maintain the solar planetary equilibrium, the pressure being such as to allow the forces of dissociation to maintain the hydrogen and the oxygen atoms as separate entities. In the extreme inner planets the solar heat increasingly keeps the water in its vapor form, and may even dissociate its chemical elements, or prevent them from associating. Further if axial rotation is absent water may be relatively repelled by solar forces to the distant side of the planet. In the outer planets

there is no boundary line between positive and negative matter; there is no well defined line where radiant energy is stopped and localized; there must be, however, a line of demarcation between solid and gaseous matter. On the planets where cell-life is prevalent these lines are not only present and well defined, but they are identical, a quality which is essential to the synthesis of a cell-molecule. In Mercury negative matter may be absent except intimately associated with positive matter, and the Sun's rays may beat on the surface of the planet as they beat on the surface of the Moon proximate to the Earth.

It is a remarkable fact that a substance so universally present on the Earth as water has not a physical duplicate. It stands on the margin of positive matter with small molecular weight and slight cohesiveness, and without it the liquid state of matter would have but slight meaning. The conditions of its equilibration seem to be the aim of all the activities of nature, for it is the basic principle which allows the molecule to be raised to the dignity of a cell. It is distinctive in molecular equipoise, and performs its part so well that nature has not attempted to imitate it. Marginal conditions of positive and negative spheres must be measurably well demarcated before the compromise liquid state obtains. When negatives predominate in the atmosphere and positives are essentially confined to solid form; when the condensing influences of the static forces of the Sun have reached a maximum over positive matter, and when the volatilizing influence of radiating forces over positive matter are not yet predominant at the planet's surface, then is the period that the water-molecule steps into equilibrium in the liquid state of matter, and the water substance courses in a cycle

which invades the sphere of the negative atmosphere as well as that of the positive solid.

It may be surmised that such elements as carbon dioxide, oxygen, nitrogen, phosphorus, sulphur, carbon, hydrogen, and others are equally important as water in the construction of organic matter. Undoubtedly all are important and even essential but neither marks an era in planetary evolution, and all of them with the probable exception of carbon dioxide existed before the period of stratified rocks. On the other hand water is the chief agent in the production of stratification. The period of cell-life may be called the water period for the cell-molecule is directly sequential to the water-molecule, and the eventuation of water is immediately followed by the disappearance of the cell. Mars by its colored areas announces the presence of vegetable life, and through its polar snow caps and canals the presence of the water cycle. Venus through spectrum analysis gives evidence of water in its atmosphere, but where are the areas of color of this planet? Perhaps hidden in the deep valleys, where man is making or has made his last stand. The spectra of the Sun and even of the comets, give evidence of the presence of hydrogen, carbon, and other elements, but the spectrum of water is only found in Mars and Venus, a planet closely approaching, and one just departing from Earth's conditions.

The question arises: Is the water-molecule exactly the same on all the planets? Spectrum analysis seems to answer Yes. All forces must be modified according to the planetary conditions and distance from the Sun. At a constant distance from the Sun a spectrum of a substance is distinctive and apparently is not duplicated by any other substance. As far as known the spectrum

of sodium does not belong to any other chemical element, nor does sodium exist on the Earth modified in any one of its characteristics, say molecular weight. Evidently a spectrum of a substance is constant and distinctive, modified only by dissociating chemical or physical conditions, and is inimitable by other substances constituted of a different number of cathode and anode particles, or having a different arrangement of these ponderable ultimates within the atomic or molecular structure. However, water may be modified, in its molecular constituency, in Mars or Venus and yet retain the same physical properties as those of water on the Earth.

How is water at first produced? The initial production could hardly occur as a synthesis at the common boundary line. Here water absorbs radiations and evaporates. It is likely to occur in this wise: The hydrogen and oxygen are mixed in the atmosphere. Under specific gravitational pressure and specific radiation-pressure thermic radiations are converted into electric charges, the hydrogen being negatively charged and the oxygen positively charged. This process will go on up to a certain maximum when the charges will neutralize, leaving the product water. This process occurs in thunder storms at the present time. Above a certain degree of radiation pressure and below a certain degree of gravitational pressure the formative process of water could not occur as the molecules of the hydrogen and oxygen are too far apart. Water is the highest type of molecular equilibration in which positive and negative matter, and solid and gaseous matter join hands in a compromise. It follows a cycle from the fluid form of the ocean to the gaseous of the cloud, hence to the solid of the snow or ice of the mountain,

thence returning to the fluid of the ocean. As H_2O it is positive and seeks the negative pole of an electric current, and as H_2O_2 it is negative and is relatively repelled from that pole. It will thus be seen that water in its cycle crosses the common boundary line in two forms, the physical and chemical, besides changing its electrical aspect.

In order to have a clear conception of the synthetic process by which the organic *cell-molecule* is formed we must fully bear in mind what constitutes a molecular body. A molecule is made up of atoms in close contact, the constituents losing their identity and the molecule becoming the physical unit. There are no interspaces within the molecular body. As all molecules are composed of the two kinds of matter one kind may predominate. Hence a molecule may have a free force of either positive or negative quality. The free force is represented in an induction field surrounding the molecular body, and this induction field may have numerous smaller molecules as constituents. Molecules relatively differ in quantity as much as masses. The conception that the organic cell has a molecular construction, the nucleolus being a true molecule and the nucleus its induction field, gives a key to the interpretation of the facts of karyokinesis and other properties of organic matter. That the nucleoli and centrosomata of animal cells, the anisotropic substance of muscles, the analogous unit in conducting nerve tissue, and various unit bodies within the nuclei and cytoplasm of cells are molecules of inductive negative potential having all the properties of the physical unit is readily conceivable when the above description of a molecule is accepted. The cell molecule is probably a compound of carbon, hydrogen, nitrogen, oxygen, and either phosphorus or sulphur, thus possessing a free

force of negative quality; or with sodium, calcium or other cation elements possessing a free force of positive quality. Its atomic constituents no doubt number many thousands, and it attains such dimensions as to be observable under the microscope.

Before the organic cell makes its appearance on a planet there must be considerable stratification of rock effected by water, and the surface matter must contain carbon, hydrogen, nitrogen, together with phosphorus, sulphur, sodium, calcium, etc., probably chemically combined with oxygen. Water is abundantly present on the surface and oxygen and nitrogen in the atmosphere, all under concentrative lines of force and static pressure issuing from the Sun and Earth. Upon this, the essential material for the construction of a cell-molecule, there are incident rays of solar heat—ether pressure—which meet with resistance to their reflection and to their transmission, and the course of least resistance is to become localized under an equilibrium. The tendency of the heat is toward dissociation of the molecular elements present, but this is resisted by the static pressure. A synthesis therefore ensues in which a cell-molecule is constructed with a free force capable of polarizing the radiant ether in its field of induction. A molecular body is thus constructed with a formula such as: $C+H+N+P+O+$.

It is remarkable that the evolution of cell-molecules within the animal body is attended by the same principles as those above defined. The blood represents the radiant energy and enters tissue surrounded by a capsule, membrane, or bone resistant to analytic reactions, as the static pressure is resistant to such on the planet's surface. Without a capsule or other resistant structure no synthesis would be possible. Of course the essential atomic elements must be present in all cases.

Each molecule is an equilibrate under the surrounding relations of matter, force and space. It assumes the globular form because this form more than any other furnishes maximum contact at minimum distance to its constituents. If the conditions are altered the molecule by its own intrinsic forces will divide. So the cell molecule under specific conditions of nutrition and pressure undergoes mitosis and equilibrates by its intrinsic forces.

The strictly physiological properties of organic matter can be shown to be founded on the physical properties of the inorganic. The author, however, is bound to say that in vital processes the properties of matter do not cover the whole ground. This is well illustrated in karyokinesis. The cell divides and redivides until the blastula or mulberry mass is attained. So far the mitotic action can be explained on the basis of the physical properties of matter. But now the query presents: Why does one part of a mass of cells extend itself to form a toe, another to form a finger, and a third a cell in the brain? Or, how comes the vast differentiation of the vegetable and animal kingdoms. The properties of matter furnish no answer. We here enter the sphere of Mind. An already formed concept of a future being or organism is clothing itself with matter essential to its expression. The gentle equipoise of the organic cell-molecule allows it to respond to the new force, and to vibrate (polarize and depolarize) at the latter's initiatory behest. The cell-molecule is the basic element of the field where Mind and Matter conjointly play. There is a sphere where the properties of Matter exclusively and all sufficiently act; and there is a sphere where the properties of Mind and Matter conjointly act.

CHAPTER VII.

The Present Evolutionary Period of Mars.

The important features of this planet are its relative distance from the Sun (141,500,000 miles), about one and one-half times the distance of the Earth from the solar body; its seasonal polar caps; and its canals, also seasonal, stretching from the summer pole beyond the equator, and well towards the winter pole. The volume of Mars is one-seventh that of the Earth, and its density is calculated as seven-tenths that of the Earth.

In as much as the planet is further from the Sun than the Earth so it is behind in evolutionary period. Mars is probably at that period corresponding to the archæan age of the Earth when the primary or Laurentian system of rocks was formed.

A difference of opinion exists among observers as to there being water on Mars. Spectra of planets must vary according to their positions relative to the Sun and the Earth. Mars in conjunction and in opposition will reflect solar light from the hemisphere proximate to the Sun, where his atmosphere will contain little or no water. In quadrature, especially if the planet's winter pole can be viewed, is the most favorable position to get the spectrum of water. Mars has but one water cycle: From surface water to the cloud, H_2O , thence to the winter pole where it manifests as a snow or ice cap, H_2O_2 , thence from the same, now summer pole, through the canals toward the then winter pole. Thus Mars is tearing up his polar unstratified rocks and forming Laurentian stratifications.

The snow caps at the poles of Mars enlarge during their respective winters and become smaller or entirely disappear during their summers. It seems that in the water cycle of Mars the water-vapor in the atmosphere and the water-liquid in canals seek the pole of the planet furthest from the Sun. The canals are filled with water from the melting snow cap which flows toward the equator and crossing this line flows toward the opposite pole. Concurrently a snow cap is being formed at the opposite pole condensed from the water-vapor in the atmosphere. Lowell concludes that owing to the flattening of the Martian poles the flow of water is against gravitation, that no known natural law accounts for its action, and that the flow must be accomplished by artificial means directed by intelligent beings.

Let us see: Mars is evolving from the period of unstratified rocks, during which condensation takes place from the atmosphere, molecule by molecule, not exclusively by the gravitating influence of the Martian mass, but by the determining influence of the gravitational forces of the solar body. Hence as the planet rotates on its axis every part of its surface must be in equilibrium from the standpoint of solar static force, level and smooth as an ocean without waves. It is true that as the atmosphere of Mars is clear and hence does not absorb the radiant energy of the Sun the greater part of this energy will be transformed into electric currents, and back polar currents neutralizing near the surface of the planet will cause disturbances, but the elevations from this cause will be relatively insignificant, as they neutralize near the surface (Fig. 7).

The influence of the solar static forces is the great surface leveler, and any part that is below the surface

of an ideal sphere will, until the period is well advanced, be filled up by condensing molecules. All points on the surface of a planet during the period of unstratified rocks as measured by the influence of the static forces of the Sun are equipotential at equinoctial times. This in general will apply to the surface of Mars.

On the top of a terrestrial mountain solar radiations are even stronger than in a valley at sea level but the outward radiations from the surface meet with so little resistance that radiations are not localized and the temperature is lower on the former. On Mars the outward radiations meet less resistance than on the Earth. The climate of Mars is not modified by the cooling effect of mountains as in the case of the Earth. Nor will the era of mountain building bring such great elevations as those of the Earth. But delicate adjustment, on the line of demarcation between positive and negative matter, of solar static influences, of radiation resistances, of radiation pressures, and chemical responses evidently produce the same results in Mars as on the Earth at the same period of evolution.

The planets are each in a state of equilibrium just as cometary matter is in a state of equilibrium at each stage of its progress toward the Sun. The comet changes according to the dominant degree of the solar body over its matter, and so it is with planets. When some great crisis occurs in the solar system such as a halt in the processes of ionization by matter reaching a maximum of diffusion, planetary matter will act by intrinsic force and thus promote concentration up to a state of equilibrium. Otherwise each step must be initiated by solar influence and this step signifies a degree of solar dominance which in turn signifies solar approximation, or increase of solar power.

Watch the effects of solar static forces on the comet. They consist of a push and a pull, the head being pulled as the body approaches the Sun and the tail relatively pushed; while on departing the tail is pushed and the head relatively pulled. Now mark the fact of the tail of the comet being always furthest from the Sun, and mark the conception that the atmosphere of the planet is its tail.

Hence our conclusions: When the north pole of the planet is presented to the Sun the upper atmosphere is actively or relatively pushed towards the south carrying the water vapor with it, which is then condensed as snow. The lower atmosphere also has the same tendency but the attraction between it and the positive solids holds it. When the south pole is presented to the Sun the opposite movements occur. The seasonal turning of the poles of a planet towards the Sun disturbs the equilibrium of the planet's system, and one of the elements of restoration of the balance is water flowing towards the opposite pole.

It is probable that the key to the explanation of these extraordinary phenomena is to be found in the constituent character of water itself. In general water has the chemical composition of H_2O . This is undoubtedly the composition of water in an electrolyte when it seeks the cathode as a cation body. On the other hand water as snow or ice has probably a composition of H_2O_2 . This makes it an anion body. The importance of this is that the water in the canals of Mars molecularly mixed with oxygen as it comes from the snow caps may be considered as a negative substance, and as such is repelled by the Sun as the tail of a comet is repelled. Each oxygen atom in solution dominates a water molecule and the physical combination being negative is as a particle of the tail of a comet. Or, we may consider

the combination as a diminutive comet, the oxygen of the molecule being the tail and the hydrogen of the molecule being the head. Thus the water in the canals of Mars through its intimate mixture with oxygen is relatively repelled by the influence of the static forces of the Sun—by the squeeze of the concentrated field. The Martian canals carry fresh water well oxygenized and as a body is negative in quality. It is probable that salt water would remain at the Martian poles.

Whether human beings or others of like intelligence exist on Mars or not the Martian canals are in general constructed by the forces of nature. From the natural canals mankind, if he exist, may direct irrigation ditches, or may even direct the particular courses of the canals, but the travel of the water for over three thousand miles at the rate of fifty-one miles a day is the work of solar energy. As to the Martian psychozoic period having already arrived when we look for geological corroborating evidence, we find it wanting. For mountains were evolved before man, and the mountain building period has not yet dawned on Mars, simply because the solar radiant forces are not sufficiently intense to undertake the work, and the stratified rocks are not sufficiently thick to give these forces the opportunity. This planet is productive of vegetation plentiful but primitive, perhaps even of fauna of an invertebrate order, but there is no convincing evidence of an intelligent vertebrated animal any more than there is of a mountain range for him to climb. A thought, however, in an opposite direction occurs. The geological periods on Mars must be longer than those on the Earth, being slower in the progress of development as the planet is the more distant from the Sun. Does animal and vegetable life evolve with corresponding rates of progression on the two planets relative to their

respective geologic periods, as indicated by the contemporary stages on the Earth? The primary evolution of the vegetable or animal cell must universally correspond to a specific geologic period, both being responsive to a degree of solar dominance, but after the bridge is crossed from the molecule to the cell the latter assumes the property or function of propagation, and karyokinesis depends on local conditions and to a large measure is independent of solar energy, and this independence is progressive as the cell marches toward a higher organism. It is possible that relatively a psychozoic era may appear on Mars at an earlier geological date than on the Earth. However, it must be concluded from the major evidence that Mars is in a state of preparation which is nearing completion as an abode of man.

Our deductions conform with the conclusions of Lowell as regards the character of the polar caps, and canals, and the presence of vegetation. He overlooks the dominance of the Sun as a factor in driving water from the summer pole of Mars, and assigns an unwarranted importance to the size of the planet in influencing evolution. Without the guiding star of a fundamental hypothesis an opinion however brilliant cannot be conclusive. Induction must be indorsed by deduction.

We find that: Mars is younger than the Earth in evolutionary period as he is more distant from the Sun; (2) Mars is a type of a planet at the end of the period of unstratified rocks; (3) the planet has no mountains because stratification is confined to the polar regions; (4) the psychozoic period has not yet arrived.

We conclude that Mars owing to its position has a relatively larger atmosphere than the Earth, that the air is less dense, clearer, offers less resistance to solar

radiations, and that its molecules are more negative. We conclude that Mars has relatively less water than the Earth, and that the atoms of the water molecule are less firmly bound than those of terrestrial water. Water on Mars may even differentiate from that of the Earth in its ionic constituents, forming a molecular equilibrate of larger size and of less positive quality and its atoms may even exist as molecules in the atmosphere. Notwithstanding these possible differentiations water on Mars will possess the same general properties as water on the Earth, because of a corresponding difference in extrinsic conditions.

CHAPTER VIII.

The Planets.

The interpretation of facts relative to planets leads us to interesting conclusions.

Mercury. The intensity of the gravitational force of the Sun has stopped the planet's axial rotation, has driven off its negative atmosphere and even its water. Perhaps the intensity of thermic radiations favors the presence of hydrogen gas, on the other hand the Sun by his gravitational force may have captured this gas. One can picture the bare valleys of Mercury covered with the bleaching bones of by-gone generations. The planet has become cationized. Whatever anion elements remain must be in the form of a tail. Mercury being in his dotage may have the embryonic habit of a comet, in the form of a pendant of negative gaseous matter, which would be detected neither by telescope nor spectroscope, as it would remain in the shadow of the planet.

Venus. Venus is an interesting planet. Schroeter concluded that the planet near its poles has mountains 30 miles high. The author's reasoning leads to the conclusion that 50 to 100 miles is a fair general estimate of the height of the mountains of Venus. The reasoning is made plain when comparing this planet with the Earth. The high albedo of Venus indicates hydrogen or other positive gas in its upper atmosphere. Calculated from a unit of surface Venus is considered as five times brighter than Mercury, the albedo being 0.92, and even higher than that of cloud which is 0.72.

These figures clearly preclude cloud as being the cause of the intense reflection. The only explanation acceptable is that her atmosphere contains a positive gas. Thus relatively little light and perhaps little heat reaches the solid surface of Venus.

If Venus has lost its axial rotation the planet's cell life must have a limited area. The evidence favors the presence of water. Hence in the deep valleys on the hemisphere proximate to the Sun the conditions may still be favorable to vegetable and animal life. Water and mountains are evidently present. Oxygen also may be there in the lower atmosphere. However, a planet which keeps the same hemisphere facing the Sun will have processes initiated which will drive water and the negative gases to the opposite hemisphere, where another essential to life, the incidence of solar radiating energy, is absent.

Venus is the earth's elder sister. Mercury is their elder brother, the first born of the present family. Other planets may have preceded Mercury. The Earth is in the prime of life and at the period when anion and cation forces equilibrate in the highest type of molecular construction. Mars being next is maturing, while the outer planets range from infancy upwards, and are partially under anion influences. In all cases the solar forces dominate the evolutionary changes, each planetary body being intrinsically in equilibrium; and moreover each planet would stay in its present state but for an alteration in the relation to the Sun's forces.

The Asteroidal Interspace. Bode's law is correct in principle. In the present evolutionary stage of the solar system it has two breaks in its application. The first is in the case of the interspace occupied by the asteroids, and the second is in the case of Neptune.

To properly interpret the facts we must reach fundamental principles. Let us go back to the nebulous state, or better still, to that ideal condition immediately succeeding a creation in which all matter is in extreme diffusion, and without particular mass form. We have already traced the then active processes towards a concentrated and positive center, and towards a diffused and negative circumference. It is evident that as the more central part of the system becomes condensed negative matter will be squeezed outward until it reaches a position of equilibrium. Being negative the repelled matter is also repelled by the negative matter of the circumference of the system. The ejected matter is thus between two repellant forces. This matter will have a tendency to divide, the more positive part becoming meteorites or meteor streams.

The Sun being a growing body with increasing forces the point where the squeezed out matter finds an equilibrium will gradually move outward. First of all the mass of Mercury contracts and Venus collects the squeezed out material. Concurrently with mass contraction the orbit of Mercury is contracting, that of Venus is not. Hence the space between Mercury and Venus increases, a miniature asteroidal interspace occurs, and a disturbance of Bode's law is the consequence.

As the forces of the Sun increase Venus is more distinctly brought under subjection, the squeezing out process is applied to this planet, and contraction of the orbit is initiated. As Mercury has approached a maximum condensation and a maximum cationization the rate of orbital contraction decreases. Hence Venus approaches Mercury and recedes from the Earth. The disturbance of Bode's law moves a step outward. The

next localization of the disturbance is between the Earth and Mars, thence to its present situation. Each step marks the boundary between the sphere of dominance of positive and the sphere of dominance of negative forces within the solar system.

Mars occupies an equilibrated position in the solar system as a body in which cation forces distinctly predominate. Jupiter occupies an equilibrated position in which cation forces are distinctly counteracted by anion influences. Both of these planets are contracting and cationizing under the increasing influences of the gravitational forces of the Sun. These processes reach a maximum which Mars is approaching. The processes in Jupiter are an evolvment from infancy. Concurrently with these processes there is contraction of the planetary orbits, which in the future will be relatively greater in the case of Jupiter. Hence Jupiter will gradually approach Mars. When the inner planets have reached their maximum of condensation and at the same time increased their positive forces, and decreased their negative they will have increased their reinforcement of the Sun's gravitational forces acting on Jupiter. Also from the initiation of a cationization process it is evident that gravitational forces will increasingly meet with a greater response on the part of Jupiter. Whereas in the case of the inner planets the maximum of condensation having been approached the rate of increase of the reaction will be lessened. Jupiter will approach Mars, the asteroidal interspace will be eliminated, the negative matter will be squeezed out, and the asteroidal bodies will join the procession of Jovial satellites, or more likely be added to the mass of Jupiter. An asteroidal space will then develop between Jupiter and Saturn.

The asteroidal interspace is occupied by an atmosphere common to the inner planets. This atmosphere occupies a point of equilibrium which progressively moves outward marking evolutionary changes in the solar system.

Jupiter. The quantity of matter of this planet excels the sum of the quantities of all the others. Why? We must bear in mind that at the beginning of the evolutionary processes of the planets that the Sun was relatively a small body; that as the Sun gained in force particles dominated by negative force were squeezed outward until reaching an equilibrated position; that the circumferential part of the solar system had no attraction for these particles but rather repulsion; and that Jupiter occupies a midway position between the sphere where positive matter distinctly dominates and the sphere where negative matter distinctly dominates. Moreover in a circular mass of nebulous matter Jupiter having a greater orbit would have a larger sphere, from which to condense his mass, than the inner planets.

Mark the differential arrangement of matter. That inward from Jupiter condensation will largely occur in the form of metallic substances; that outward from Jupiter anion predominance is opposed to condensation; and that in Jupiter where anion and cation matter equalize the condensation will be almost exclusively crystalline. The inner planets are relatively small because their orbital spheres are small. The planets external to Jupiter are smaller than Jupiter because their anion constituents oppose condensation and because of their distances from the Sun. Jupiter is relatively large because most of his material is capable of crystallizing. Mars is relatively small because his orbital space is a remnant of the inner planetary space

where cation matter distinctly predominates. Mercury is small because his orbital space is small.

Furthermore Jupiter has been a growing planet. All the planets are condensing and contracting under the growing influence of the Sun, and this influence affects Jupiter. But, the lines of force emanating from the Sun becoming continuously more concentrative squeeze out, of the solar field embracing the inner planets, particles which are intrinsically negative. These collect first in the asteroidal sphere, but afterwards they are pushed further outwards. The asteroidal field is a source of supplies which feed the great Jupiter. The contraction of his orbit and the direct influence of the lines of force of the Sun are the elements which stimulate the flow of this matter to his open hand. He sifts the material, condenses the relatively positive part, and by his own lines of force repels the relatively negative. Truly Jupiter is growing and his mass even excels what he is credited with. Jupiter is approaching his maximum growth and the farther planets will yet approximate Jovial dimensions.

Jupiter has a phenomenon in a great red spot. It marks an axial rotation which is relatively slower than surrounding gaseous matter. It behaves as if it marked the location of a high mountain slowly changing; but Jupiter has not arrived at that evolutionary stage, which would permit us to think that he is engaged in mountain building. The most plausible explanation of the phenomenon is that Jupiter has absorbed an asteroid, that it is resting on his solid surface, and is being gradually leveled down by his forces.

The clouds of Jupiter are not subject to solar influences as clouds in the atmospheres of the inner planets. Why? Simply because they are composed

of positive and negative matter, perhaps of the hydrogen and oxygen types, not chemically united, because the solar lines of force are not intensified sufficiently for a water equilibrium. For the same reason the albedo of Jupiter is high, for a positive gas possesses high reflective qualities.

The volume of Jupiter is 1309 times that of the Earth. The mass is given as 317 times that of the Earth; and the density as one-fourth that of the Earth.

The mass of Jupiter is calculated from his perturbation of the asteroids. This indicates the intensity of his gravitational radiations or weight. Weight is confined to a reaction between positive forces. It has no direct relation to the negative or anion matter of the body, nor to the ether that is bound by the molecular forces.

We concluded that Jupiter has been mainly built up by the process of crystallization, which requires the presence of equal amounts of positive and negative matter. Ether is polarized in the molecular polar fields. We concluded that the inner planets were evolved by the process of crystallization and metallic condensations; and that the constituents of the Sun were largely cation. It is evident that under these conditions the conception of mass and that of density must be altered. If the red spot of Jupiter is an asteroidal body resting on his surface, then Jupiter has an immense solid body relatively lighter than the solid bodies of the inner planets chiefly on account of the scarcity of metallic deposits, but also because of the ether bound during the process of crystallization.

Planets undoubtedly have relative differential weight, just as unit volumes of different material have different weights.

The axial rotation of Jupiter is accomplished in 9.55° . The day is shorter at the equator than at higher latitudes. Bright white spots rotate more quickly than dark ones in the same latitudes. Belts have a different speed of rotation. According to Lowell, the bright equatorial belt lies exactly on the equator and its position is not affected by the planet's aspect to the Sun. The dark belts are cherry red and shine partly by intrinsic light—the self luminosity of Jupiter is a dull red glow. There is an alternate brightening and fading, broadening and narrowing of the north and south tropical belts which manifest during a succession of years.

The explanation of these phenomena appears to be as follows: The atmosphere of Jupiter consists of positive and negative gases, the *common boundary* (see Chapter Period of Cell Life) not having been established, and the conditions for water equilibrium not being attained. These gases may, to some extent, diffuse, but the active forces largely separate them into regional belts. The negative gases will absorb the solar radiations, will appear dark, and will in turn emit the absorbed energy as red radiations, thus appearing as self luminous. The positive gases, probably hydrogen, will reflect light and appear bright, hence are not self luminous, which they would be if Jupiter were a fiery furnace. The central belt is a positive gas, as that is lighter than the negative owing to the minuteness of its molecules.

With regard to the differential rotatory velocity: Jupiter revolves in his orbit at the behest of the electric currents of the Sun. The Sun sends out gravitational lines of force which diffuse in direct proportion to the square of the distance traveled. The action of the

forces of the Sun is through a medium and each particle acted upon at whatever point is acted upon by the particle preceding. An atom of hydrogen and an atom of oxygen are influenced by the Sun's forces, but really it is the molecules of the ether which are in contact with these atoms which act on them, and these contact molecules act in obedience to the law that forces react with an intensity inversely as the square of distance. Hence the reaction between the ether and the atoms of the gases in the atmosphere of Jupiter is differential in accordance with the construction of the atoms. Positive gases will respond more intensely than negative to the forces of the Sun. Mark the adhesiveness of positive matter in general. The solar lines of force act on the proximate surface of Jupiter as an inhibitory force to orbital revolution, and act differentially in degree on the particles of the atmosphere. This conclusion does not accord with the conception of moment of momentum. Jupiter travels in his orbit at the rate of eight miles per second, and rolls as on a floor made up of the terminal lines of force of the Sun, and the Jovial material has differential adhesiveness. The rotatory speed of any particle in the atmosphere of Jupiter is directly proportional to the inhibitory action. The real length of the Jovial day may be calculated from the time it takes the red spot to rotate.

Jupiter in part of his orbit passes through solar lines of repulsion. These, however, have the same effect as those of attraction on his axial rotation. It is the direction of the lines of force which is the essential to inhibition as we will see in considering the rotatory direction of Neptune.

The periodical changes in the relative brightness and dimensions of the north and south tropical belts must

be seasonal. The general law being that the more negative matter is repelled from the pole presented to the Sun, that is from the summer pole. Jupiter has not altogether forgotten his cometary ancestry and still makes an effort to form a tail at the pole relatively distant from the Sun.

Saturn. The extraordinary part of this planet is his system of rings. Several years ago the author drew a plan of the solar system in which he pictured Saturn as capturing a comet. This was a conception not based on deduction, but rather in the nature of a guess, and he afterwards rejected it: (1) Because the capture of a comet would partake of the character of an accident and the author believes that no part of the solar system is built up by accidents; (2) a comet has not as much positive matter in its construction as the rings of Saturn evidently have in theirs; (3) cometary matter does not equilibrate as near a planet as do the rings of Saturn. There is, however, this consideration: Comets change, getting less negative and losing material as they approach the Sun, and more negative and gaining material as they leave the Sun. Under any circumstance for a comet to be in the exact state which would enable it to equilibrate as the rings of Saturn would be in the nature of an accident which the solar system knoweth not. Moreover, the building up of a planet's system (the planet and its satellites) occurs by the acquisition of matter of central origin and not of circumferential origin.

We concluded that Jupiter gathered matter which was being eliminated from the asteroidal interspace, sifting it, and absorbing the more positive particles and rejecting the more negative. Hence the stream continued outward from Jupiter. Besides Jupiter is sifting his own gaseous matter, consolidating part and

eliminating part, the latter being too negative for the concentration of Jupiter's lines of force joins the stream outward. Particle by particle this outward stream seeks an equilibrated position. The Saturn system absorbs them, and does so differentially. Some of those particles constitute the inner ring, these having the same molecular type as oxygen ions (atoms), or perhaps they are more negative. They transmit light, hence appear dark from the terrestrial viewpoint. Other particles build up the middle ring. These are probably of the nature of positive ions. As compared with the molecular quantities of the inner ring they are as the hydrogen molecule to that of oxygen. They possess properties resistant to radiation, hence reflect light and the mass appears bright from the Earth. Other particles constitute the outer ring. They must be very minute ions, probably of positive character and so diffuse as to be semi-transparent, partly absorbing and partly reflecting light.

We have in the most general way considered the ultimate constituents of the rings. Physically, matter will have a tendency to assume the form of a cometary character. A group of particles, whether positive or negative as a whole, will develop a relatively positive head and a relatively negative tail. The head will lead and the tail will follow in the course of the group round the planet, that is the head will be inhibited more intensely than the tail in the orbital velocity, when on the surface of the planet proximate to the Sun. Such groups constitute the tores referred to by Lowell. We have elsewhere shown that even a molecule of oxygen in the terrestrial atmosphere tends to the cometary form by developing a positive pole attracted by the solid mass of the Earth, and a negative pole which is in-

directly repelled. The rings of Saturn mark a period in the evolution of a planet. They will flatten and become as the belts of Jupiter, the more positive matter being retained by the planet and the more negative matter being eliminated. The latter will seek an equilibrium further out and may construct a ring-system for Uranus.

What we wish to insist on is that each particle according to its concentrativeness or diffusibility, its cation or anion qualities, finds an equilibrated position amidst the concentrating lines of force emanating from the Sun, supplemented by lines of similar character emanating from the planetary body. The equilibrated position of the particle refers to its distance from the Sun and its distance from the planetary body. The velocity of the particle in its course round the planet is the result of the action of the electric currents of the Sun on the matter of Saturn, causing an orbital revolution, and an inhibition by the static forces of the Sun, which results in an axial rotation. Given a constant amount of current electric induction acting on the body, and a constant amount of inhibitory solar static force, then the relative velocity will be according to the character of the particle, that is to the intensity of the free force of the particle, positive if the particle takes the positive direction, negative if it takes the negative direction. In the case of planets the positive direction only has to be considered—the negative elements following the positive but retarding their speed.

From the viewpoint of the Earth matter in the atmospheres of the outer planets is observed to rotate with differential speed. But the greater the apparent velocity the less the real velocity on the proximate surface of the planet, for the real motion is in the planet-

ary orbit, and the motion of the axial rotation in the semi-circle proximate to the Sun has to be subtracted from the orbital velocity of the planet. On the distant semi-circle the opposite occurs. Matter on the proximate side of Jupiter for instance, is said to be retarded about one-tenth of its orbital speed.

Uranus. When we go back to the cyclic period of nebulous matter in circular motion we find condensation occurring in the solar system from within outward. Each planet must condense the matter from a sphere commensurate with the length of its orbit. Hence the volume of each would normally increase with the distance from the Sun. But the part of the matter which inherently seeks condensation is the positive, and in a unit space positive matter decreases from within outwards. According to Bode's law the interspaces increase with the distance from the Sun, which means that they increase with the relative increase of negative matter. Uranus is probably the only planet which, as a direct result of nebulous conditions, has normal volume. The inner planets have lost matter by disintegrating processes, Jupiter and Saturn have concurrently been built up at the expense of the volumes of the inner planets, and as we will see, Neptune is an infant. Uranus is a planet direct from the nebulous state without modification by secondary processes.

Uranus is remarkable for his immense atmosphere. In fact some observers suppose that no solid matter exists. This undoubtedly is a mistake. The process of crystallization has likely given Uranus a solid mass, although the solar lines of force must be quite diffuse at his distance. The lines of force emanating from his mass are not sufficiently intense to condense his satellites into bodies giving electric responses of positive character, for they act as negative bodies and have retro-

grade movements. At this distance from the Sun negative matter predominates, and the dominance is more pronounced in the satellites than in the planetary body. Hence in obedience to the electric currents of the Sun the satellites have a partial negative direction. With further predominance of negative matter the satellites would seek independent orbits, but at a more distant position.

Neptune. This is the youngest as to time, the last in evolutionary period, and demonstrably the outermost and most distant planet from the Sun. It is reasonable to conclude that at present there are nuclei of ultra Neptune planetary bodies. There are, undoubtedly, condensations partaking of the cometary character. Neptune partakes somewhat of this character. His north pole probably bears the hereditary mark of the head of a comet. His retrograde axial rotation and his direct orbital revolution indicates a transitional process whereby Neptune is forswearing his past allegiance to negative authority, and is rendering homage to the electric currents of the Sun by a positive reaction. The induction lines emanating from the solar static forces are too diffuse to cause a direct axial rotation, but sufficiently intense to cause a positive or north pole development, which, reacting with the electric induction of the Sun, gives the planet a direct orbital movement.

As the induction lines of the static forces of the Sun develop they will, by their concentrativeness, push Neptune outward, for he is still sufficiently negative to resist condensation, and thus the planet's position will yet accord with Bode's law. At the critical distant point the planet will begin to build up by absorption from the other planetary spheres, and hence his orbit

will contract. The planets are like a piece of elastic with the solar forces stretching it from both ends.

As the Sun's forces develop they will push the negative atmosphere common to the system further out. The advancement of this process may be marked by the evolution of matter from the form of a cometary body to that of a planet. First the comet's orbit will be changed in direction. The part of the head of the comet proximate to the Sun becomes the north pole of the planet. This will be followed by an axial rotation and the tail will be twisted round the body of the head, the most distant part of the head becoming the south pole of the planetary body. The comet's orbit then changes to the planetary form, a change concurrent with the development of poles and seasons. The critical point in this change is indicated by the polar changes following the terrestrial equinox March 20. Thus the comet precedes the planet and the transformation occurs by the same general processes common to all evolutionary phenomena, that is, curtailing useless appendages and developing others with new properties. The comet is a planet in embryo and from the nascency to the cination there is one general principle of evolution—cationization.

CHAPTER IX.

Comets.

The common atmosphere of the solar system is the *Home of the Comets*. A general idea of the character of a cometary body may be gained by supposing that the Earth's atmosphere becomes separated from the solid mass and is injected into space. It would assume the form and constitution of a comet. Elementary changes would follow the separation but the relative qualities of positive and negative matter in our atmosphere would enable it to maintain a cometary character, only less negative than most if not all of the comets. The physical form of a molecule in our atmosphere must be in a degree cometary, with a positive head attracted by the Earth and the more negative part relatively repelled by the terrestrial lines of force.

Let us trace a comet from its nascent state to its dissolution. There is no purely positive or negative matter of the complex or ponderable variety. The only purely positive and purely negative matter in the universe are electric charges, and even they are united to ponderable matter. Hence there is some positive matter in the outer atmosphere. Just enough to do the binding, which is minimum in degree.

When two or more of the larger planets are in conjunction an increased gravitational pull is made on positive matter of the common atmosphere, in line with these planets concentration occurs, and the nucleus of the comet is formed. There is thus initiated a kinetic force between the planets and the Sun on the one part and the positive matter of the comet on the other.

To understand cometary phenomena two important considerations are essential: (1) The ultimate constituents of the cometary body; (2) the field which it travels.

The comets are many millions of miles long, hence they are drawn from a field of differential concentration of force. Hence their parts have differential diffusibility. The head is relatively concentrated, the tail relatively diffused. Moreover, different parts of the head and tail partake of differential diffusibility. That is to say, that although the whole mass of the comet is dominated by negative force the dominance increases directly proportional to the distance from the nucleus. Again comets assume more or less of a common form. Head (nucleus and corona) and tail. Each ultimate particle of the cometary mass must possess the same elements of form. Further, each molecule of the comet will have a positive nucleus on which is exerted the gravitational pull, and a negative pendant resisting the concentration of the field and hence on which there is exerted a squeeze or an indirect repulsion.

The field traversed towards the Sun is a blanket of concentrating lines of force, which diffuses directly proportional to the square of the distance from the solar body. The primary force of this field is the positive free force of the mass and of the north pole of the Sun. The electrolytic form of the Sun gives his south pole a negative force. This force radiates to the south of the plane of the Sun's equator. The region of the equatorial plane, however, may be within the induction field of the free force of the main body of the Sun. The field has a retarding influence on a particle in direct proportion to the intensity of the concentration of the field and to the quantity of the free

negative force of the particle; and the solar forces an attracting influence directly proportional to the reacting positive forces of the particles, and inversely to the square of the distance from the Sun. We must regard each particle as a diminutive comet, with a positive head presented to the Sun. It is evident as the particles have differential forces that they will be differentially retarded and some will be ultimately lost to the comet. This is according to fact. It is also evident as the comet approaches the Sun that the nucleus will become more dense and more positive, and that the more negative matter will be thrown off to join the tail. The forces of the field act on the cometary mass by a push and pull, thus stretching it as a piece of rubber. Each modification of the cometary body is of the utmost significance as indicating a general law applicable to each body of the solar system.

We will follow the cometary body toward the Sun. The kinetic force is the reaction between the positive forces of the Sun and the positive forces of the comet. If we note the fact that the particles of the cometary mass possess different degrees of negative dominance it will be plain that each will arrive at a point where the concentration of the lines of force is such as to inhibit further progress. This applies to the head as well as to the tail. A comet will approach the Sun until the squeeze of the lines of force stop it, and this squeeze will apply at the same time to every part of the mass. Each particle of the comet strikes a degree of resistance which will check its course, when it will swing round the Sun as if sliding on a curved smooth surface of solid matter. Each cometary particle pierces the medium until reaching a curved line demarcating a degree of concentrative force equal to its expansile re-

sistance. Each particle therefore swings round the Sun independently of every other particle. The comet thus reaches the sphere of the south pole of the Sun. Each particle of the cometary mass is maintained in its relative position by its relation to the medium, not by any cohesive force within the mass of the comet. Only the matter of the nucleus can possess cohesive properties. The solar lines of force maintain the integrity of the comet, and it is these lines of force which are responsible for the intrinsic changes of its mass— attracting and concentrating some particles and squeezing others out of the field. Moreover, in the same manner the solar lines of force are the chief factor in maintaining the Earth and other planets as intact bodies, although intrinsic cohesiveness in these is more manifest.

Within the induction field of the solar south pole the kinetic reaction is between two negative forces—the negative force of the solar south and the negative force of the comet. Comets thus depart from the Sun, the tail leading, the head following. The field is in possession of the free force of the south pole of the Sun. Hence the positive forces of the solar body and of the north pole are excluded. The reactions between the positive forces of the comet and the field being kinetically void leaves the reaction between the negative forces of the two bodies kinetically supreme (Fig. 3).

We have thus far dealt with simple forces of attraction and repulsion, which in nowise account for a comet's path being otherwise than lineal. The effort to ascribe a revolutionary power to gravitation is futile. Electric currents are the only forces which will direct a body in an orbital path. The futility of an opposite consideration is obvious.

We will consider the Halley comet. This body of matter is predominantly negative, and obeys the law of negative matter revolving reversely to positive matter in the whirl of the induction field of solar currents. Its course in approaching the Sun is not marked by any pronounced deviation from a lineal direction. Gravitational force is mainly the directive agent. The orbit, however, has a slight curve caused by the electric whirl. As it nears perihelion it gets more under the influence of the electric currents, at the same time the lineal attraction is inhibited by the squeeze of the concentrated field. It is thus whirled into the region of the south pole, where lineal repulsion is asserted. In its orbital course the reaction between the electric currents and each particle of the cometary mass being directly proportional to the intensity of the free (negative) force of the particle, and, of course, inversely as the square of distance, as it whirls its tail round the Sun it maintains its integrity. Notwithstanding that distance is a factor of decrease of intensity of the reaction between the electric currents and the cometary particles their velocity increases with the distance. This is due to the increase in the intensity of the negative force of the particles as the distance from the Sun increases. There is also a decrease in the weight of the particles (positive force) in direct proportion to the distance, and this decrease removes an influence inhibitory to velocity (excepting momentum).

On its outward path as the distance of the comet from the Sun is increased the lineal force (repulsion) and also the circular force are weakened; but as the comet approaches the solar equatorial plane the lineal force is further weakened and the circular force (electric) is increased by the comet being brought more distinctly

in line with the solar currents. Hence the comet again crosses the equatorial plane, and it does so as a negative force reversely to the direction of the planets. In the case of the Halley comet this occurs some distance beyond the orbit of Neptune, and consequently it must approximate the region of the atmosphere of the system. That the comet maintains its integrity at this distance is due to a concentration of positive matter by the Sun's gravitational force. At its aphelion when the Halley comet crosses the plane of the Sun's equator (its node) it is well within the region of positive lines of force emanating from the Sun, and these lines exercising a lineal attraction the comet will commence its return voyage.

On May 20th, 1910, the Halley comet passed between the Sun and the Earth. The Earth divided the tail because surrounding the planet is a concentrated field of positive force whose lines squeeze out the negative matter of the tail. The terrestrial lines of force must extend beyond the Moon's orbit, otherwise the satellite would revolve round the Sun as a planet. The lines will extend outward until meeting the solar lines in exact strength to their own, when, if the lines of the two bodies are similar, they will curve toward a point of neutralization, if dissimilar they will mutually neutralize.

On May 20th the Earth is to the south of the Sun's equator, and hence the Halley comet must also have been to the south of that plane when passing between the solar and terrestrial bodies. The comet is then receding from the Sun in obedience to the reaction between negative forces. The Earth at certain phases of its orbit obeys the same law.

Comets with orbital periods of less than 100 years, with the exception of a few, revolve directly, that is in the same direction as the planets. The Halley comet has a retrograde movement. Comets of longer periods are about divided equally as to the direction followed. The explanation of these facts must be as follows: Nascent cometary bodies are supremely negative. They lose part of their negative matter by the squeeze of the solar field. It is thus evident that comets tend toward a more positive constitution, which will in the end change their direction.

An important feature relative to the response of comets to extraneous forces, such as those of the Sun, is in the relative position of positive and negative constituents of the cometary body. Positive matter is always favorably situated to be acted upon by an extraneous force. The relatively positive head always approaches the Sun thus being advantageously placed to be acted on by the medium through which the forces of the Sun radiate. It is not then astonishing to find cometary masses revolving in the direction of positive bodies. They become partially cationized by the action of the field. Free magnets (the magnetized state is essentially a body of equal positive and negative forces) placed in an induction field obey the law of positive rotation. What is the exact degree of negative preponderance necessary to overcome the advantageous position of positive constituents of a body, the author is unable to say. A comet undoubtedly loses matter on approaching its perihelion and gains matter on approaching its aphelion. If, however, its orbit is hyperbolic it breaks up entirely by becoming part of the common atmosphere.

The capture theory of comets is probably true to the extent that individual planets partially capture the messengers from the system's atmosphere. Their orbits then become elliptical and they revolve within the planetary sphere. The comets are members of the solar system as much as the planets themselves. By modification a comet might even become a satellite of an outer planet, but as a whole it could not be added to a planetary body excepting, perhaps, to Uranus or Neptune.

Why does a comet follow an orbit which is so distinctly elliptical while a planet follows an orbit which approaches a circle? The very slight momentum possessed by a cometary mass, owing to its negative constitution, allows it to change direction immediately on change of the directing motory force. The comet whirls round the Sun in obedience to the stimulus of electric currents, but when the motory force is changed to the repulsion of the south pole, almost without hesitation it follows the dictation of its new master. The comet acts in the same way when changing from the directing agency of a lineal force to that of a circulatory force. Another cause of a comet following a pronounced elliptical circuit is the absence of polarity. The solar-cometary reactions are simply attraction between positives north of the plane of the Sun's equator, and repulsion between negatives south of the plane. On the other hand, on March 20th, just as it is well under lineal repulsion, the Earth presents its positive pole to the Sun and thus the repulsion is modified. On September 22nd, just as the planet is well under solar attraction, the Earth turns its negative pole towards the Sun and thus modifies the reaction. The terrestrial orbit thus approaches the circular form.

CHAPTER X.

The Orbit of the Earth.

The elementary forces which cause the Earth to revolve round the Sun and to follow an orbit of an elliptical form and at the same time to assume seasonal movements are complex. The problem is that of two electrified polar bodies, the one relatively minute revolving round the larger. As masses the two bodies are predominantly positive. We will regard the Earth as being in equilibrium at its mean distance from the Sun, and the variation of its orbit from this mean by particular pushes and pulls as a departure from equilibrium. The forces may be divided into orbital and seasonal. The orbital forces are:

1. Mass attraction or gravitational force, which is strictly a lineal attraction caused by the reaction between two positive bodies.

2. Electrolytic or magnetic attraction and repulsion, also lineal. The following formula prevails: The reaction between two distant positive poles is attraction; the reaction between two negative poles is repulsion; the reaction between a positive and negative pole is mutual neutralization, with an elasticity induced in the medium by the polarized strain.

3. The induction whirl of a positive body round solar electric currents of constant direction.

4. Repulsion between solar and terrestrial electric currents of opposite direction.

5. Momentum.

The seasonal forces are:

1. Repulsion (resistance to attraction) between like poles depending upon the mutual impenetrability of like polar fields.

2. Attraction between unlike poles depending upon the elasticity of the medium caused by the polarized strain of its molecules, initiated by the presentation of the poles.

3. The straightening of solar and terrestrial electric currents in parallel direction according to Ampere's law.

4. Momenta.

The free force of a pole is qualitatively the same as the free force of a mass and the direct reaction between positive poles is simply gravitational. In all cases, however, qualitatively similar induction fields possess a mutual impenetrability. For instance a molecule has a free or an induction field which is maintained by its impenetrability to surrounding like fields. Nevertheless, the molecule, if positive, possesses cohesiveness.

The Sun attracts a comet until the lines of force become impenetrable to those of the comet. We find that when the Earth is north of the plane of the Sun's equator that the terrestrial north is relatively repelled mainly by the mutual impenetrability of the polar fields, while the planet's orbit is contracting by direct reactions. It is, however, more correct to say that the impenetrability of the fields resists attraction of the bodies rather than that an active repulsion exists.

The neutralization of positive and negative free forces of distant bodies is effected by means of polarization of the medium. The molecules of the medium when completely depolarized are in a state of equilibrium, when polarized they are in a state of strain. At the moment

of its initiation this strain will produce a slight pull on the distant bodies:

(1) Rupture may occur—molecules of the medium are dissociated into positive and negative resultants, the resultants forming new combinations. This is a method of propagation of electric currents. It is the method of chemical action which is essentially accomplished without a medium.

(2) The molecules of the medium being subjected to a polarized strain acquire an elastic property which may pull the distant bodies together. In this case no chemical alteration in the medium occurs. This takes place between positive and negative poles of magnets when these are attracted. It may occur between electrically charged bodies of different sign. In these instances no spark manifests and the medium is not ruptured, merely displaced.

Different media no doubt assume different degrees of elastic properties. In astronomical events we have mainly to consider the medium between positive and negative bodies, as in a state of equilibrium, and the forces kinetically negative. Positive and negative ponderable forces generally do not produce a sufficient strain in the medium to cause attraction of bodies. Magnetic attraction is an exception to this rule and we find this form of attraction manifested only in seasonal movements, when the body is in pivotal equipoise as regards other forces. In the main when attraction between a positive and a negative force is manifest the attraction is assisted by a reaction between forces of positive character.

A good deal of importance has been attached to the effect of incident light on bodies. It is claimed that radiant energy exercises a repulsion on a body on

which it is incident. Heat or light are energy dependent on unequilibrated ether which has the property of impenetrability. Hence, when set free, it must have a push on particles. That heat parts ponderable matter can be demonstrated in many ways. The repulsive force, however, of heat and light on such a body as the Earth is a negligible quantity. Energy follows the course of least resistance and when striking a polar body it is converted into electricity, localized, or reflected. These are the courses of least resistance. To effect a push on the Earth against the other forces would be the course of greater resistance. Moreover, heat and light energy transformed into electricity is a more important kinetic energy.

The following electric laws formulated by Ampere have an important bearing:

(1) "Parallel electric currents of opposite direction mutually repel; those of the same direction mutually attract." Fig. 13 indicates the manifestation of this law. When the currents are of the same direction the induced lines of force tend to embrace the two currents; when they are opposite in direction, the lines of force tend to pass between and repel them.

(2) A series of laws may be summed up: "Currents obliquely directed induce stresses in the surrounding media tending to straighten their paths, as nearly as possible, in parallel direction."

(3) "The force exerted between two parallel portions of circuits is proportional to the product of the two currents, to the length of the portions, and inversely proportional to the simple distance between them." This law of Ampere is fundamental to Kepler's second law: "The radius-vector of a planet de-

scribes equal areas in equal times." The law of Kepler is based on the effect, the law of Ampere on the cause.

We must conclude, from the immensity of the Sun's mass and the character of its forces, that there is a central nucleus of maximum density, positive in quality, and possessing in a high degree the property of electric conductivity. This center is under the influence of electric currents and may not be hot. The photosphere is under the influence of heat produced by neutralization of the electric currents. The central solar body is the primary conductor of the solar system and may be at a standstill, or may even have a movement in a direction reverse to that of the photosphere. The photosphere maintains or has assumed the band form of the nebulous state. As previously concluded all matter having a positive reaction with the electric currents revolves from right to left in the upper semicircle when viewed from the north (Fig. 7). In this relative position the solar positive current is approaching and the solar negative current is receding. The interterrestrial electric currents take the opposite direction.

The Orbit. Let us take up the matter of the terrestrial orbit at the period of transformation of the Earth from the cometary to the planetary condition (Fig. 14). Let us picture the Earth as an element of a spiral nebula. The head points northward and approaches the Sun and the tail southward and recedes from the Sun. During this period crystallization is taking place in the head, and the positive pole of the crystals point northward and incline toward the Sun. This process gives the Earth its present magnetic polarity. As soon as the head assumes polarity it will seek a position more nearly the plane of the Sun's

equator. Concurrently, the solar heat and light are converted into electric currents passing through the terrestrial body (Fig. 7). The solar currents and the terrestrial currents tend to straighten their paths according to the Ampere law. This will push back the north pole and bring the south pole of the head nearer the Sun. The head is thus in equinoctial position and the solar and terrestrial equatorial planes are straight. The tail then is driven toward the equator of the polar body—the tail emerges from the equator instead of emerging from the south pole. The body now assumes axial rotation. Part of the tail is driven off by the concentrating lines of force of the Sun and part of it is twisted round the rotating body and becomes its atmosphere. The cometary body assumes planethood.

In the study of planetary orbits we must consider circularity within the plane of the Sun's equator as the normal form of an orbit. Accepting this circular path as the normal orbit we will proceed to consider the causes which produce the departure from normality. First we will see how the departure is initiated. The terrestrial body placed on the plane of the Sun's equator with equinoctial conditions will be supported in its position by the Ampere law, the electric currents of the two bodies tending to maintain a parallel direction. The seasonal or magnetic forces also assist in maintaining the normal relative position of Earth to the Sun. There is, however, a differential mass attraction of the terrestrial hemispheres. The northern hemisphere is heavier than the southern, for the reason that it has a larger mass, also for the reason that its pole is positive, and also because it is positioned north of the equatorial plane of the solar body. The north pole will thus be tilted toward the Sun. Further, between the terrestrial

and solar south poles repulsion obtains. An orbit oblique to the plane of the equator of the Sun results.

The orbit of the Earth has two major divisions, each of which has minor divisions. The major division is effected by the equatorial plane of the Sun. This is the most important line of demarcation within the solar-planetary space. As a space-mark the elliptic has minimum importance, whereas the plane of the Sun's equator has maximum importance. On the north side of the plane is a field of lines of force emanating from the static force of the north pole of the Sun; and on the south side is a field of lines of force emanating from the static force of the south pole of the Sun. There may be, however, an area embracing the immediate neighborhood of the plane of the equator of the Sun in which lines of force from the mass of the Sun radiate predominately. These lines are positive in character and hence support the lines radiating from the solar north pole. The extent of this area, however, is a matter of fact which the author is not prepared to determine. On the other hand, the radiation from the poles may meet at the plane of the equator, the radiations from the body of the Sun being confined to a space proximate to the solar mass. The lines of force from a magnet take the latter course. However, the solar body is an electrolyte.

The forces of orbital motion are divisible into circulatory and lineal. The circulatory motion is initiated and maintained by the inductive energy of the electric currents of the Sun. The forward movement, however, is reinforced by the momentum. We will consider the lineal forces as we proceed.

Under the influence of the circulatory forces and momentum on June 3 the Earth crosses the plane of the

Sun's equator. Preceding this date the planet was under the influence of repelling forces which produced a dilating orbit. The momentum, supported by repulsion of electric currents of opposite direction, causes the dilation to continue until July 6 against contracting influences. From July 6 to December 5 the Earth is passing through a concentrating field of positive force radiating from the Sun, which compels a contracting orbit by mass attraction, accentuated by the electrolytic force of the solar north pole—a reaction between positive forces of the two bodies (Fig. 14).

From July 6 to September 22 the Earth presents her north pole to the Sun, whose free force accentuates mass attraction. The Earth approaches the Sun by mass attraction, although it does so against the resistance of similar fields of lines of force emanating from the solar and terrestrial north poles—against seasonal or indirect reactions.

From September 22 to December 5 the Earth presents her south pole to the Sun, and between this pole and the Sun's forces there is neutralization and a certain pull from the elasticity of the medium. In addition the positive forces of the Sun, although partly neutralized, sweep over the Earth and attract the terrestrial body by a reaction between the masses. The orbit thus continues to contract.

From December 5 to June 3 the Earth is south of the equatorial plane. Weakly at first but increasingly the negative lines of force of the southern field envelop the Earth, neutralize her positive forces, kinetically act upon her negative forces, and push her orbit outward. This repulsive force probably reaches its maximum of intensity at the equinox, but continues with less intensity until June 3.

From December 5 to March 20 the Earth presents her south or negative pole to the Sun, thus being advantageously placed for a repelling force to act upon her. From March 20 to June 3 the Earth presents her north or positive pole, but as there is only slight kinetic reaction between positive and negative forces, the solar negative lines of force sweep over the Earth, partially neutralize her positive forces and kinetically repel the planet through a reaction between negatives.

Throughout the whole orbit there is repulsion between electric currents of opposite direction according to the Ampere law. There is also a momentum which tends to carry the Earth in a straight line according to the Newton first law of motion. All of these forces are lineal, consisting of a push or a pull. The momentum impels the body in a straight line. The great circulatory force is the induction whirl of the electric currents of the Sun, and this is the only simple circulatory force. The induction whirl is cyclic, in double form, positive and negative, the positive matter seeking the north while whirling from right to left in the upper semi-cycle as viewed from the north, and the negative matter seeking the south while whirling in the opposite direction.

From December 5 to January 4 is a period of thirty days; from June 3 to July 6 is a period of thirty-three days. It will be observed that the difference of three days in the length of the periods is fully explained by the relation of the momenta to the acting forces previous to the periods. In both instances the momenta tend to dilate the orbit, thus acting with the forces previous to the latter period and against the forces previous to the first period. The attractive or repulsive force of Sun should be greater on the terrestrial body

the further the Earth is north or south of the solar equatorial plane.

Giving due allowance to momentum it will be observed that the polar forces of the Sun predominate in the modifications of the orbit from a normal circularity. When the Earth is north of the equatorial plane of the Sun the terrestrial orbit contracts; when south of the plane the terrestrial orbit dilates. It must not be forgotten that the modifications from normal circularity are produced by an attraction or a repulsion which is simply lineal.

The Seasons. The planetary seasons are produced by differential reactions between solar and planetary fields of force. In the modification of the orbit the attracting or repelling force traverses the medium from primary to primary, but a seasonal movement is a play between fields, or a manifestation of stored energy in the media. The reactions are magnetic in character. The mutual impenetrability, distortion under pressure, and elasticity of fields between like poles; and the elasticity associated with the polarized strain of fields between unlike poles, are factors of the differentiation (Figs. 5 and 14).

The seasonal movements of the Earth are in the main a differential rate of approachment or a differential rate of recession of the terrestrial poles relative to the Sun. During the period when the Earth is north of the plane of the Sun's equator, except from June 3 to July 6, the terrestrial south approaches the Sun at a greater rate than the terrestrial north pole; and during the period when the Earth is south of the plane of the Sun's equator the terrestrial south recedes from the Sun at a greater rate than the terrestrial north pole, except from December 5 to January 4. In the first period, although the terrestrial north is relatively receding, it

is actually approaching the Sun; and in the second period, although the north pole is relatively approaching, it is actually receding from the Sun. The north pole acts as a moveable pivot on which the south swings, as the tail of a comet swings relative to the Sun on the pivotal head. We will show hereafter when these rules do not apply.

We will divide the orbit into four main sections for the consideration of the seasonal movements.

From January 4 to March 20 the terrestrial south is relatively repelled by the south of the Sun, supported by a straightening of the paths of solar and terrestrial electric currents. The elasticity of the medium between the terrestrial north and solar south produces a slight pull between these poles. At the same time the distance between the Sun and the Earth is increased, and the terrestrial north actually recedes. During this period the movements of the terrestrial poles are a differential recession from the Sun, produced by the acquired properties of the medium—impenetrability and elasticity of like fields assisting recession and the elastic pull of unlike fields retarding recession. At the same time the direct action of the solar south is greater on the terrestrial south than on the terrestrial north.

From March 20 to June 3 the terrestrial south is still relatively repelled by the south of the Sun, and the elasticity of the medium produces a slight pull between the terrestrial north and solar south, but these forces are opposed by the electric currents of the two bodies being diverted from parallel paths. From June 3 to June 21 the polar forces are weak and the momentum carries the previous seasonal movements onward until the latter date. The distance of the Earth from the Sun continues to be increased during these periods, and

the terrestrial north actually recedes from, although relatively approaching the Sun. The difference between the period previous to March 20 and that following is that in the former the terrestrial south is advantageously placed to be acted on by the south of the Sun, and that in the latter the terrestrial north has the advantage of relative placement. March 20 marks a critical point in the orbit.

From July 6 to September 22 the fields of force between the solar north and terrestrial north, being similar and impenetrable, resist the approachment of these poles by mass attraction. Mass attraction, however, overcomes the resistance but the terrestrial north is inhibited by the impenetrability of similar fields relative to the movement of the terrestrial south in the same direction. The medium between the solar north and terrestrial south exercises an elastic pull on these poles, which assists mass attraction. The relative movement of the terrestrial poles is assisted by solar and terrestrial currents tending to straighten their paths in parallel direction.

From September 22 to December 5 the same forces prevail as in the previous period, only the electric currents of the two bodies resist the divergence of their paths from parallel direction. From July 6 to December 5 both poles approach the Sun, the south relatively faster.

From December 5 to December 21 the polar forces being weak the momentum carries the previous movement onward. The length of this period is sixteen days, whereas the corresponding period from June 3 to June 21 is eighteen days. The explanation is found in the differential weight of the terrestrial hemisphere, and hence differential momenta, the northern being the

heavier. From June 3 to June 21 the heavier pole is turning towards the Sun, hence the momentum is relatively greater. From December 5 to December 21 the heavier pole is relatively receding from the Sun, and hence the seasonal movement is retarded.

There are two periods, that between the June solstice and aphelion and that between the December solstice and perihelion, in which the general rule does not hold. In these periods polar action is weak, and the solar and terrestrial currents strain to straighten their paths in parallel direction thus producing seasonal movements. It will thus be seen that the seasonal movements of the terrestrial poles are simply different rates of accession to the Sun as the Earth's orbit contracts, and different rates of recession from the Sun as the the Earth's orbit dilates. In each case the terrestrial head (north) is the slow-moving pole. The orbit of the Earth should be considered as the path of its north pole or head not the path of the center of the terrestrial body, just as a cometary orbit is taken from the path of its head. A remarkable analogy exists between the kinetic character of the north (positive) pole as compared with the south (negative) to the kinetic qualities of the positive and negative electric matter.

The following is worthy of the strictest attention. The changes in the presentation of the terrestrial poles on March 20 and September 22 are the causes of differentiation of a planetary orbit from that of a comet—the round form from the elliptical.

CHAPTER XI.

The Moon.

Our satellite revolves at a mean distance of about 240,000 miles, or about sixty times the equatorial radius of the Earth, and about one four-hundredth of the distance of the Earth from the Sun. Its volume is one forty-ninth that of the Earth. Its mass is said to be one-eightieth that of the Earth, and its density six-tenths the Earth's density. In comparison with its primary planet no other satellite is nearly so large. From the viewpoint of the Earth the Moon has no axial rotation. From the viewpoint of the Sun the Moon rotates once in a lunar month. Its orbit (path round the Earth) is an ellipse with an eccentricity three times as great as that of the Earth. The velocity of the Moon round the Earth is about six-tenths of a mile per second, or about one-thirtieth the orbital velocity of the Earth. The Moon's poles alternately tip towards the Earth, just as the Earth's poles tip towards the Sun. No water and no atmosphere have been observed on the Moon. The albedo is 0.174. Mountains in the Moon have been estimated to be as high as 30,000 feet.

How did the Moon become a satellite? First we may dismiss the comet-capture theory by stating that no cometary body could have the construction of the Moon. If we go back to the nebulous phase of the system we must suppose that the Earth was condensed from a gaseous band having a breadth of about seventy-four million of miles. It is reasonable to suppose that primarily there were numerous centers of condensation, and that the resulting bodies were gathered into one.

Suppose, however, that there was one exception, that at the outermost part of the band there was condensed a body of less density and of smaller size than the main one. Every time the smaller body was in conjunction with the larger body the orbit of the former would contract. If the two bodies were of the same density they would unite as one body, but the smaller being less dense it would find an equilibrium in the radiating lines of force of the larger body, at some distance, and thus become a satellite. Both bodies being positive their orbital direction would be the same, the smaller body just before losing its independent orbit would revolve slightly outside of the larger. The Moon would thus become entangled with the terrestrial lines of force, but would maintain her orbit round the Sun in obedience to the solar electric currents. The volume, mass and density of the Moon as related to those of the Earth allow the former to equilibrate amidst the terrestrial lines of force exactly in its present relative position. The minutest constitutional variation would be followed by a modification of its position, and a change of position would modify its constitution. Mark the analogous behaviour of a comet amidst the lines of force of the Sun, as it rounds the solar body at perihelion.

The Moon follows a continuous forward path round the Sun, its velocity round the Earth being only one-thirtieth its mean velocity round the Sun (Fig. 24). The Moon's orbit round the Sun has the form of a wave with its crest at full moon and its trough at dark moon, the wave having a period of a lunar month. The orbit of the Earth is the line of undulatory equilibrium. The true orbit of the Moon is round the Sun. When nearer the Sun than the Earth the Moon decreases its orbital

velocity, and when more distant from the Sun than the Earth the Moon increases its orbital velocity. This corresponds to the velocity changes of a particle on the surface of a planet.

The forces engaged are those between the Moon and the Earth, and those between the Moon and the Sun. Those between the Earth and Moon are: (1) gravitation between two positive bodies; (2) repulsion between the bodies by impenetrability of like fields; (3) attraction between electric currents of like direction. The effects are modified by the bodies being polar. Thus when the Moon is north of the equator of the Earth it is enveloped in a terrestrial positive force and its distance from its primary should be decreased; when south of the equator the distance should be increased. The author has not sufficient data to entirely verify these conclusions. The Sun's influence no doubt is a very great modifying factor. The problems of the Earth's orbit mainly consist of the actions of two bodies, here there are three. When the lunar body is the more distant from the Sun the terrestrial lines of force increase its orbital velocity, when it is nearer the terrestrial lines decrease its velocity. In the case of the former the relative position of the Moon is that of a ball thrown on a floor moving in the same direction as itself, in the latter it is that of a ball thrown on a floor moving in the opposite direction to itself. The Moon, however, has always a forward movement in her orbit round the Sun.

The forces between the Moon and the Sun are (1) the lines of force from the static forces of the Sun which inhibit the Moon's velocity in its course round the solar body when the lunar body is nearer than the Earth. These lines of force also inhibit the or-

bital motion of the proximate surface of the Earth thus causing axial rotation. It will be seen that the action of the static forces of the Sun on the Moon when the nearer body is fundamentally the same as on the proximate surface of the Earth. (2) The induction whirl of the electric currents of the Sun cause the Earth and Moon as positive bodies to follow a common orbital direction.

Of all bodies in the solar system, excepting the Earth, the Moon is the most favorably situated for sustaining vegetable and animal life. (1) It occupies the same relative and favorable position in the system as the Earth. (2) From the standpoint of the Sun it has an axial rotation of 28 days. (3) It occupies the relative position to the Sun's forces which permits of the water equilibrium. (4) The same position allows it to have a common boundary line between solid and gaseous matter, between positive and negative matter, and at which solar energy is stayed. (5) It has mountains which modify its climate and produce a wide distribution of the water cycle.

It may be accepted as true that the proximate surface of the Moon has neither atmosphere nor water. But these would be relatively repelled by the lines of force emanating from the Earth, as mark the tail (atmosphere) of a comet in relation to the Sun, and also mark how water behaves on Mars. Also mark this fact that no solid body (except it be Mercury) is without an atmosphere. The Moon must have both atmosphere and water. As compared with the Earth the Moon has the only disadvantage of a longer day. As compared with Venus it has an alternate day and

night which, according to preponderating evidence, Venus has not. The Moon, according to our deductions, has also a hemisphere on which there is sunshine, water, oxygen, and mountains, a combination which Venus probably has not. As compared to Mars the Moon has reached an evolutionary period further advanced—has mountains and related water cycles, while the surface of Mars is entirely level. Although water is undoubtedly absent from the proximate surface at the present time, yet there is evidence of there having been water in the past. On Mars and on the Earth the water equilibrium evidently preceded mountain building. Evidence of the action of water is not wanting and if water then there must have been air, of which oxygen was a constituent. Evidence of the action of water on the proximate surface of the Moon is proof of a previously independent orbit. No satellite can preserve its water and air conditions on the surface constantly facing its primary, any more than a tail of a comet could surround the cometary head. The water as cloud together with the atmosphere would be driven to the distal side. Evidence of the former presence of water would tend to show that the Moon very late in her history became a satellite, in fact at a later period than Mars is at present. Perhaps the Moon was an asteroid when the asteroidal space was between the Earth and Mars. A satellite Moon points to a catastrophe to proximate moonites.

The organic cell is produced within a limited range of ponderable pressure (the combined inductive action of the static forces of the Sun and planet) and radiation pressure (the intensity multiplied by the resis-

tance to radiation). According to our deductions the conditions are absolutely obtainable on the other side of the Moon. The intensity of radiation is as great at the top of mountains as at the sea level, but the resistance to radiation is much less at the mountain top and the energy is thus reflected whereas it is localized at the sea level. In the valleys of the Moon solar energies may be intensely localized thus bringing the conditions within the range essential to cell production. Too much importance is not to be attached to the size of the planetary body in this respect, as the chief factors in producing an equilibrium of forces essential to cell life reside in the degree of solar activity. This is too great in Mercury and too little in Jupiter. The concentrating lines of force from the Sun are essential to bringing oxygen and hydrogen together as water, and solar radiations of specific intensity volatilize and may even dissociate it. Great intensity of solar lines of force repel it. Water equilibrates amidst the solar lines of force from the position of Venus to that of Mars. The water area of our star-space is also the area of cell life, and the Moon is in the center of this area. The intrinsic forces of Mercury have not been sufficient to maintain a water equilibrium, and the forces of Jupiter have not been able to produce it. Life conditions are plastic and the organic cell is very much differentiated as shown by its variety on the Earth. The Moonite may excel in symmetrical form and beauty and in high intelligence when compared with his special type of the Earth. The common boundary line, water and hence the organic cell undoubtedly exist on the distal surface of the Moon.

RELATION OF VELOCITIES OF SATELLITES.

Lowell publishes the following tabulation of the orbital velocities of satellites of different systems, and points out the striking parallelism between the systems:

	Mean Speed, Miles a Second	
	Of Primary in Orbit	Of Satellite about Primary
Jupiter	8.1	
Sat. 1.....		10.7
2.....		8.5
3.....		6.7
4.....		5.1
Saturn	6.0	
1.....		9.0
2.....		7.9
3.....		8.2
4.....		6.3
5.....		5.3
6.....		3.5
8.....		2.0
Uranus	4.2	
1.....		3.5
2.....		2.9
3.....		2.3
4.....		2.0
Neptune	3.4	
1.....		2.7

The revolution of the planets in their orbits is in response to the electric currents of the Sun. The speed will be inverse as the distance and direct as the quantity of the responsive force of the body. As the planets take the direction of positive bodies, it is evident that the more relatively positive the planet is in its construction the greater the speed. Hence each succeeding planet from within outward will have a

double cause of decrease of orbital velocity—the increase of distance and the decrease of positive quality. There is also a decrease of momentum which depends entirely on positive matter in motion. As regards the satellites of any particular planet we can eliminate distance from the Sun as a cause of variation of speed, for the mean distance of a satellite from the Sun may be taken as the distance of its primary.

We have concluded that each planetary body is in a state of equilibrium in the position it occupies amidst the lines of force emanating from the Sun. Further, each satellite body is in a position of equilibrium amidst the lines of force emanating from its primary. As a corollary each satellite of a series having a common center must be less positive and more negative than the preceding inward satellite. The relative amount of positive matter in any satellite will be inversely proportional to its distance from its primary, and the relative amount of negative matter will be directly proportional to the distance from the primary. Hence satellites which respond to electric currents as positive matter will decrease in velocity as the distance increases from the primary. In the case of the satellites of Jupiter and Saturn, the decrease of positive quality is an important factor in causing the decrease of velocity as the mean orbital distance increases.

Variations in the momentum owing to a change in the relative amounts of positive and negative constituents of the satellite is an important factor of modification of velocity. This will be more particularly shown in the case of Uranus.

Uranus presents a separate problem. The orbital movements of the satellites are retrograde, and this feature must be in obedience to the predominance of

negative forces. Hence as the satellites increase in their negative quality in direct proportion to the distance from the planet, they ought to respond to the currents of the Sun with a velocity increasing as the distance from their primary increases. But here is forced upon our consideration another factor of modification of velocity. Momentum is a property of ponderable force, which elementarily is attraction between positive bodies. Negative force is not ponderable, in fact it has the opposite quality repulsion. Hence the satellites of Uranus, and other negative bodies, as comets, have very little momentum, that little varying according to the relative amount of positive matter in their constitution. The satellites of Uranus have a velocity inversely proportional to their mean orbital distance, because they acquire momentum (their impelling forces being equal) directly proportional to the amount of their positive constituents, which in general, decreases as their mean orbital distance increases.

Momentum as a factor of modification of velocity must be considered as having bearing on all orbital and axial movements. The conception that purely negative matter is incapable of acquiring a momentum that would overcome the slightest resistance is of capital importance in the solution of astronomical problems. The immense momentum acquired by such a positive body as the planet Mercury, and the almost negation of the property of acquiring momenta by cometary masses, with the differentiation of such a property as regards planets, as regards satellites, and as regards comets, must materially differentiate the motion of these bodies. That exactly one undivided half of the matter of the solar system is incapable of accumulating a momentum sufficient to carry it one inch against a minimum re-

sistance after the impelling force is removed may be incredible to some minds. Momentum differentiated by the quality of the element is an important factor in modifying the velocity of all celestial bodies.

A question, of only theoretical value, presents. Would a purely negative body in motion in an absolute vacuum and without external resistance (no such body or state exists) become absolutely immobile on removal of the impelling force? According to the Newtonian law such a body would move forever. A question of practical importance is formulated thus: Would a body of purely negative matter in motion be capable of imparting motion to another body before or after the impelling force is removed? If we eliminate the property of cohesiveness acquired, by lines of force as a causal factor, we can answer this question negatively. The real quantity of matter in a cometary body (positive and negative matter) must be immense, yet the disturbing influence on other bodies is hardly perceptible. If a comet struck a planet, which it could not owing to the radiating lines of force of the planetary body, the blow would be insignificant. If a comet's nucleus became predominantly positive and be drawn into a planetary system, as in the case of meteorites, it would strike the planetary body, but the cometary tail would be left behind by the squeeze of the lines of force of the planet.

Relative to the orbital speed of a body it must be borne in mind that it is crossing gravitational lines of force which must have a differential retarding influence. Hence the problem is complex, and thus differing from the experiment of a light and a heavy body falling in a vacuum at apparently the same speed.

When we compare the motion of the satellites of other planets with that of the lunar body, we find a difference in their relative velocities. The Moon's motion round the Earth is an increased velocity at full Moon and a decreased velocity at dark Moon. The Moon always moves forward in her orbit round the Sun, while in this respect some of the satellites appear to have a real backward movement. Taking the Moon's orbit as the basis of comparison, we find a satellite whose orbit is retrograde simply increasing its velocity when relatively proximate to the Sun, and decreasing its velocity when relatively distant from the Sun in its orbit round the solar body. This is exactly opposite to the motary variations of the Moon. A body sufficiently negative in its construction to follow an anion or retrograde direction in answer to the electric currents of the Sun will act oppositely in other ways to the actions of a positive body.

CHAPTER XII.

Spiral Nebulae.

Accepting a mass of gaseous matter in circular motion as a state intermediate to a past and a future period of planetary evolvment it is pertinent to contemplate the manner in which the spiral form occurs in nebulae. We must conceive that the gaseous mass has north and south poles, that is, it has an electrolytic arrangement, the north pole having a free force of cation quality and the south pole of anion quality. The succeeding phase in the cycle will be separation of the nebulous mass into bands having interspaces of ether. This will occur from cation concentrativeness. Then we must consider the progressive phases as follow: (1) The matter of the north pole of the band will condense and that of the south will diffuse. (2) The north poles of the different bands will be drawn towards each other by positive concentrativeness (gravitational force) and the south poles of the bands will mutually repel, just as two cathodes mutually repel (Fig. 26). (3) As the whole mass is in circular motion the north end, being nearer the central or solar band, will gain in its orbit and the south pole will follow as the tail of a comet follows the head. Thus the spiral is formed. The second phase is portrayed in Fig. 27.

It will be seen that each band is a modified comet, that the north is the cometary head and the south is the tail. As evolutionary processes progress the north becomes the planetary body and the south its atmosphere. As condensation progresses part of the

tail is driven off and forms a common atmosphere to the system, and the remainder gets wrapped round the head by rotatory motion of the embryo planet.

It is generally supposed that the Earth is a globe flattened at the poles. Our deductions are that from being an electrolyte the Earth is oval, with the large end of the ovoid pointing north. The atmosphere was exactly opposite in form, the south end being higher than that of the north. The atmosphere being negative seeks the pole furthest from the Sun, which by seasonal changes is the winter pole. The facts as far as we can ascertain them support our deductions. If we could cut the Earth in two by dividing it at the equator we would certainly find the northern hemisphere weighing more than the southern. It undoubtedly measures more in circumference if we take an average of land elevation. But we believe that even at sea level there may be some difference between the actual circumference of the north and the south at similar north and south latitudes. These are deductions from the electrolytic idea. There is, however, a counteracting force in the rotatory movement of the oval mass. Be this as it may, the fact of there being more land in the northern hemisphere than in the southern supports our concept of the Earth being an electrolyte and an oval body.

MULTIPLE STARS.

The solar system may be accepted as a celestial unit. As such its essential features are limited in number. A mass or aggregation of masses of ponderable matter whose forces are self-neutralizable, and which are isolated from all other forces by an interspace of im-

ponderable ether, to the extent of being kinetically independent. The forces of a celestial unit form a central Sun and an induction or neutralization field. In the central Sun is stored the main energy of the system: (1) a static force from which straight lines radiate throughout the field, and which induce lineal motion; and (2) a current electric force from which circular lines of force radiate throughout the field and which induce circular motion.

In the solution of the problem of binary or multiple stars it is of the greatest importance to consider the inter-relation of the systems of the universe, or the quantitative relation of all matter and all force to all space. There must be a pressure existing in interstellar space which must have a constant minimum. The great ocean of ether intervening between the stars must have a pressure which in the main is constant. We have concluded that the reactions of the forces of systems in a north or south direction is neutralization with a static equilibrium. At right angles to this direction a repulsion between systems exists. Then the question resolves itself thus: Can a body with solar properties be placed within the induction field of another Sun? This is similar to imparting solar properties, say to Jupiter, and in an earlier period of planetary life the possession of such properties is possible. What changes would be required to make Jupiter a Sun? Simply a change in his electric relations whereby his currents would become primary to those of his satellites. At an earlier period before Jupiter attained his present equilibrium his mass was contracting and consequently emitting heat. This heat being incident to his satellites would be converted into electric currents, and returned as electric energy to Jupiter. A thermo electric cycle would be thus established between Jupiter

and his satellites. Jupiter, however, as a positive body, may have maintained his present orbit in obedience to the currents of the Sun. Neither Jupiter nor the Sun was as large as at present, but Jupiter may have been relatively larger than now, and might have approached being able to swing the Sun. It must be remembered that orbital motion is not a result of a reaction between two current forces but between current and static forces. An interesting system of motion then obtained. The inner planets revolved round the Sun; the present Jovial satellites and other asteroidal bodies revolved round Jupiter; and the outer planets with the common atmosphere revolved round both the Sun and Jupiter. The Sun and Jupiter revolved round each other as twin stars. The mutual reactions would be: The static forces of Jupiter would obey the electric currents of the Sun; and the static forces of the Sun would obey the electric currents of Jupiter. The Sun being the larger and more central body extended his dominion and took possession of Jupiter's electric currents, and thus Jupiter was subjected to planetary conditions. In Fig. 13 we see pictured individual and common fields revolving round electric currents. Perhaps if the primary conductors were free to move they would revolve round each other. We have so far considered the Sun and Jupiter as binary stars, but Saturn or any of the other planets might have an element of a multiple star. Multiple stars indicate a phase of the great cycle in solar systems. The order is somewhat as follows:

Complete nebulae; spiral nebulae; star nebulae; binary stars, solar planetary systems. The last evolving into the first by solar extension. Each phase establishes an equilibrium in reference to space.

It is possible that during initiatory condensation two bodies might be formed equal in dimensions and of equal distance from the center of the system. Such bodies would revolve round a common center and might maintain particular systems of planets, but in the end they would become one body. This conclusion is inevitable because each body would continue to grow and hence extend its influence over the other. Their orbits would thus contract until they would ultimately unite. Orbits of planets contract because the Sun's forces increase and the planetary bodies cationize and hence gravitational force doubly increases. It is thus with twin stars. Planets are kept apart from the Sun (1) by the impenetrability of like fields of force; (2) by repulsion between electric currents of opposite direction; (3) by the momentum according to the Newton law, and (4) by repulsion of the negative force of the south pole of the Sun. These forces are not constant throughout the orbits. In the case of binary stars a very important element of repulsion is withdrawn, and attraction substituted. The electric currents of binary stars are similar in direction and hence the circular lines of force tend to bring the currents together. (5) The relation of all matter and all force to all space. This is the most important element in the equilibration of solar systems in their relation to each other and to space. If a star were eliminated from the universe the others would modify their lines of force and the evacuated star-space would again be filled with matter and force. Perhaps the modification would be such as to fill the star-space with another star.

True binary stars, that is those physically connected, must belong to the same system and will ultimately form one Sun, or assume the relation of Sun and Planet.

Binary phenomena may furnish evidence as to the dimension of solar systems. It appears that our system is small when compared to some others.

That orbits of multiple stars are elliptical is evidence of the polarity of at least one of the bodies. That the ellipse approaches rotundity is evidence that the two bodies are polar. This conclusion is apparent when we study the Earth's orbit. After a system has clearly evolved from the nebulous period, when the matter of a body has reached by its own initiative a physical equilibrium, the emission of light (not previously absorbed) is evidence of the polarity of a body with a system of tributary planets. In fact apart from the glimmer of nebulous matter, and apart from reflected light of planetary bodies, the constant luminosity of an astronomical body is evidence of its being a Sun, a polar body with tributary planets.

THE UNIVERSE

We conclude that the universe is infinite. Matter from its basic properties diffuses until space is filled. A solid mass is evidence that all space is filled. The character of ether, as deduced from our hypothesis, implies a certain relation to space, which, if altered, would alter its molecular quantity. The assumption of an ether infinite as space implies a universal minimum pressure with a constant molecular quantity for fundamental matter. This again implies universal condensations—an infinite number of solar systems as cosmic units. The units, however, may vary in the quantities of their potential energies, in their material quantities, in their spacial amplitude, in their planetary details, in the

periods of their cyclic phases and to limited extent in their equatorial planes; but the general principles of their constitution, of their kinetic forces, and of their cyclic changes, must be the same. As the ether must be universal so the cathode particle must be the ultimate unit of ponderable matter of the universe. The amount of light emitted by a Sun-star may not be proportional to its material magnitude, but the character of the color elements of light must be universally identical, although the physiological appreciation may differentiate. If our deduction be correct that a color corpuscle lengthens transversely as it diffuses this may be a basic element in measuring the distance of the stars.

A solar system like an ether molecule is in cosmic equilibrium, and the equilibration is safe-guarded by opposite presentation of negative circumferential bands between which a reaction must partake of the character of repulsion. A repelling reaction between systems implies a universal relationship between solar systems and infinite space—that each system according to intrinsic conditions has allotted to it spacial requirements by exigencies of force. Thus there is inferred a universal pressure depending on the quantitative relation of all matter and all force to all space, for otherwise matter would diffuse infinitely. The variations in its cyclic phases and the changes from molecular to electrical potentials will alter the inductive forces of a solar system, and thus induce periods of contraction and expansion which will modify the amplitude of its induction field. These changes account for the “drift” of solar systems. For, if in the neighborhood of our solar system star-systems are contracting or expanding, we must necessarily alter our relative position to the systems. The systems are not bound on hard and fast lines but mutually supported as by elastic cushions.

The material changes occurring in a partial vacuum evince that matter and force maintain a certain relation to space. The comet expands as it leaves the Sun, thus maintaining a spacial equilibration. Theoretically, we find no property of matter that would confine it to finite space. On the other hand, if by any means matter were limited, it would diffuse infinitely by its inherent properties. The condensation of matter to the solid form is incidental to a universal pressure.

The universe is infinite, matter and force are infinite, and solar systems are numerically infinite.

In Fig. 25 let the perpendicular lines represent equatorial planes of Suns. The negative signs at the terminals of these lines will denote the anion qualities of the rims. Let the transverse lines represent polar planes of Suns. The plus and negative signs will denote the cation and anion qualities respectively of the north and south poles. It will be seen that the systems are in static equilibrium. The reaction between rims is one of repulsion up to the point of establishing equilibration. The reaction between positive and negative poles is neutralization, but in the absence of any variation in the pressure the medium remains statically equilibrated. The reaction between positives is confined to the interior of the systems, and hence there are no kinetic forces exercised between the systems, although, no doubt, there is some neutralization. Kinetically each solar system of infinite space is independent unity, and the quantitative relation of all matter and all force to all space determines the dimensions of the plot allotted to each.

COSMIC REFLECTIONS.

A planetary system would fall to pieces, like an oxygen molecule in a partial vacuum, if it were not

bolstered up by other systems. The light from the stars is evidence of a medium of force in interstellar space, and the properties of matter demand that all space be occupied. The grand equilibrium of all matter and all force in all space under a universal pressure must be a determining factor in the production of natural phenomena. If the solar system be accepted as a cosmic unit, then we can conceive that the systems are arranged in some form or order, in which their positive poles in general point to the celestial north, and their negative poles to the celestial south; all in harmonious adjustment, each passing through independent cycles, but each exercising a polarizing influence on enviroing systems; each possessing all the essential forces for its own evolutionary processes, yet evolving in complete unison with interstellar forces. Each unit system must possess a domain directly proportional to the magnitude of its forces, and must bear a constant relationship to the universal equilibrium, the maintenance of which must furnish a resistance to the mutual encroachment of planetary systems.

The equilibrium of all matter in space must bear a certain analogy to the equilibrium of a given amount of gas in a partial vacuum. With the decrement of pressure the molecules divide and redivide until an equilibrated condition is attained, chemie affinity is overcome and the law seems to be: As the pressure decreases the molecules decrease in dimensions and increase in inductive force, with increased fields of induction which fill the space. Up to the critical point the vacuum tube is occupied by force from the increased potentials of the dissociating molecules, whose fields of induction in the aggregate are commensurate with the space. It is conceivable that if the solar systems were reduced in number within a given space the others

would so adjust themselves that all space would be filled with force, the universal equilibrium being thus maintained as the equilibrium in a partial vacuum is maintained.

Astronomers describe a great luminous starry band encircling the solar system called the Galaxy or Milky Way. This band apparently is relatively immovable, while the solar system revolves on its axis within, and occupies part of the area enclosed by the band. It was Herschel's opinion that the plane of the Galaxy bears the same relation to the universe as the ecliptic plane to the solar system. The galactic plane cuts the ecliptic plane at an angle of about 60° . We will substitute the solar equatorial plane for the ecliptic.

The stars in the celestial vault, as seen through a telescope, are mostly condensed near the galactic belt, appear less numerous in the regions most distant from it, and more numerous the nearer the region is to it. With powerful telescopes a large majority of stars are actually observed in the Galaxy. The nebulae appear as irregular masses of luminous clouds, and appear to be most numerous where the stars are the least numerous, or, the more distant the region from the Milky Way the greater the number of nebulae are observed.

If Herschel's idea is correct, there are two great cosmographical lines at right angles to each other: One drawn through the "galactic equator," and indicating in general, the direction of the equatorial planes of the universe; and the other drawn through "galactic poles" indicating in general the direction of the poles of the universe. It is conceivable that an infinite number of lines of infinite length drawn parallel to the solar equatorial line may pass through the equatorial planes of an infinite number of galaxies. The conception may

be expressed thus: At whatever point of space an observer may be placed, that point will be where the "equatorial plane" of a galaxy is cut by a line drawn through its "poles." The conception implies that the view we have of the starry universe is, in the main, the view presented independently of the location of the viewpoint.

A solar system must vary in appearances: (1) According to the phase of the cycle through which it is passing, and (2) according to whether the polar or equatorial aspect of the system is presented. The distance intervening, the dimensions of the system, and the medium through which its light is transmitted, must be modifying factors. Accepting our solar system as a cosmographical unit, and keeping in mind its equatorial and polar aspects, the question presents: Whether cosmographical units are thrown into space promiscuously, or are arranged in some general order? It is true that the ecliptic plane (or plane of solar equator) does not parallel the galactic plane as one might predict; but if we consider the form of star spaces as being elliptical (probably slightly distorted by cosmic pressure), and that all space is occupied, not only by matter, but by solar systems, then it is evident that all unit systems cannot be arranged on exactly parallel lines. Although generally their equatorial and polar planes may be uniformly disposed. Our system may be placed so as to fill a nook of the universe, and hence the necessity of its lines being oblique to the general direction. Moreover, if solar systems are endowed with the proper polarity, then their tendency to arrange themselves in uniform direction is indisputable. Thus Herschel's great conception of the galactic plane being an indication of an universal order must be correct.

If we mentally picture the simple arrangement of solar systems being placed so that their lines in the main are uniformly directed, we will see that when we point our telescopes in the general equatorial direction we are on the line of incidence of the equatorial blaze of innumerable suns, each a center of a star-space. The reflected light of their tributary planets, aurora polaris, or any other evidence of planetary systems, we have not, these being darkened by the relatively brighter light of their respective suns. Nor does it matter much, except as to the brilliancy of the particular star, in what stage of evolution the system is presented to us; only, if the solar dimensions have reached that critical point where electric energy is absent from the space, the space will be a celestial dark spot. Probably the most brilliant evolutionary stage of a sun is when his dimensions are about equal to half of those of his maximum growth. At this period probably the maximum amount of energy is being absorbed at its poles, and such energy will regulate the intensities of its equatorial light. The qualifying term "equatorial" may be objected to, as apparently our Sun gives out light from his whole presenting surface, but it must be understood that the photosphere is a dispenser of light; and that we mean to convey the idea that transformation of electric energy occurs in the central sun, and radiates as heat and light along his equatorial plane.

Now let us turn our telescopes towards the celestial north or celestial south. We are looking along the polar planes of the systems, and we have a side view of solar-planetary wheels. Mainly, we are in the shadows of polar energies, although here and there the electric light from some great sun obliquely pierces the spaces. Furthermore, in viewing the polar aspect of the

systems, we may be able to judge, from polar activities, what particular phase of its cycle a system is manifesting. If we could interpret the significance of the manifestations we might know the relative dimensions of a Sun to those of his planetary domain. It is, however, to be considered that a solar mass from the polar aspect may show as a relatively dark spot, radiating energy being here absorbed, while the soft diffusive light may be the stream of electrified ions emanating from the various poles of tributary planets. For instance, a nebula in Lyra presents a comparatively dark central area which may be a polar presentation of an immense sun; while the surrounding lighter area may be a polar view of its photosphere; the accompanying planets being outside of the latter area, and emitting auroral light from their poles. This, viewed from its equatorial aspect as others in a galactic arch, may twinkle as an ordinary star. The nebula of Andromeda appears as an oblique presentation of a solar planetary space during the cyclic epoch of maximum diffusibility when matter exists in band form with intervening ether spaces. The Andromedal sun evidently forms a central rod (Fig. 21).

Could solar systems revolve around a common center? No. An orbital revolution is caused by current forces, and an extraneous force sufficiently great to cause a solar system to revolve round it, would interfere with intrinsic forces, and produce a relationship of the planets to the Sun, such as the Moon's relation to the Earth. The mutual influences of solar systems are lineal in character and produce only polarized effects. There is no evidence that heat and light will directly produce rotatory movements, although it is conceivable that they may possess a repulsive force, and thus

be a cause of cosmic pressure. It is only when these forces are transformed into electric currents that rotation occurs. The transformation takes place through the presentation of differential or polarized potentials to the incident forces, and no such presentation is made by a solar system as a whole, although its individual parts possess the essential polarities. Heat or light passing from one solar system to another maintains its distinctive character as a displacement movement or wave motion, and can have only local effects at the points of incidence. In the broadest sense of the term, interstellar forces may be classified as follows: (1) Radiating forces (heat and light) producing, if any, only chemie and physical changes in matter; (2) static forces producing polarization.

When we study the character of electric charges and currents differentiated according to their positive or negative quality; when we study the chemical and physical character of molecules differentiated according to their positive or negative quality; when we study the physiologic properties of animal cells and tissues, exhibited through the intricacies and delicacies of labyrinthian structure, yet reducible to the common and ultimate units of attraction and repulsion; and when we compare these differentiations with those manifested in phenomena pertaining to the Sun, planets and comets, as constituting a unit system, we must conclude that, however complex may be the problems presented for solution, they must be solved through the formulation of a hypothesis basic to a generalization. The writer believes that the correctness of his conception of electric charges being composed of differential elementary units of matter is evidenced by the simple facts of natural phenomena, and that in this concep-

tion there is indicated a ground work upon which the physical structure of the universe is built; leaving, however, untouched the genetic problems of unit matter, the reasonable solution of which is to suppose that there were no genesis.

CHAPTER XIII.

Illustrations.

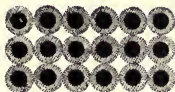


Fig. 1

Fig. 1—Ether Molecules: The figure shows purely positive matter central, and purely negative matter circumferential. These are the smallest molecules in the Universe, each constituted of two atoms, which are electric units. Mark the absence of an induction field. The molecules are under a pressure which is not sufficiently great to obliterate the interspace.



Fig. 2.

Fig. 2—The Cathode Particle: The ponderable ultimate possesses a positive free force surrounded by an induction field. When negatively electrified it is the ultimate of the cathode ray. The unelectrified particle is constituted of two positive electric units and one negative. The cathode particle and the positive and negative ether atoms are the only indivisible particles in the universe under the quantitative relation of matter to space. Under extreme decrement of pressure the anode particle is found to be many times the size of

the cathode particle and is probably reduced in dimensions by the squeeze of increased pressure.

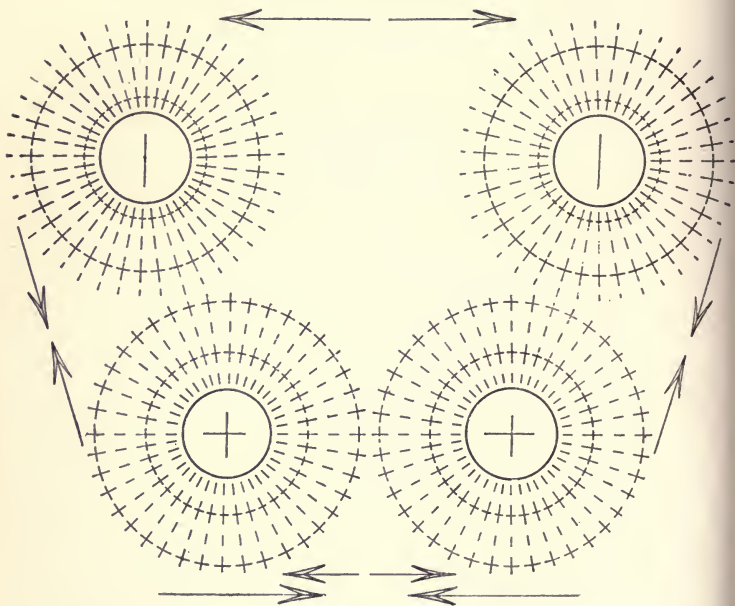


Fig. 3.

Fig. 3—The Primary Forces: Attraction between positives; repulsion between negatives, and neutralization between positives and negatives. The inner arrows between the two positive bodies indicates the impenetrability of like induction fields. As ether is imponderable it always presents its neutralizing pole to the primary force (Fig. 15).

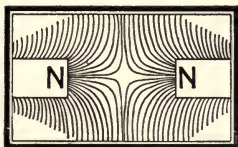


Fig. 4-A.



Fig. 4-C.

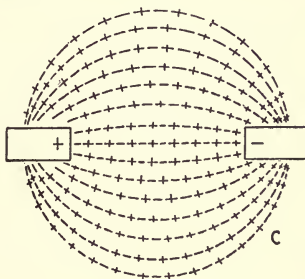
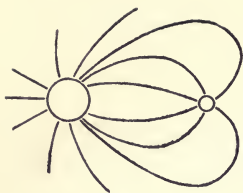
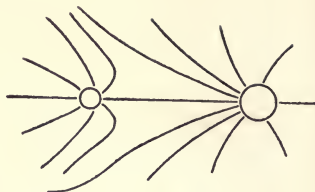


Fig. 4-B

Fig. 4—Lines of Force: A, B, and C show secondary forces, or acquired properties of induction fields; elastic strain between positive and negative forces, and mutual impenetrability of like fields.



A
Fig. 5-A.



B
Fig. 5-B.

Fig. 5—Reactions of Fields of Force: A shows lines of force from two bodies differing in the quality and quantity of their electrifications. B shows two bodies having electric potentials of the same quality, but differing in quantity, the lines of forces showing distortion and impenetrability of the field to a like field.

Fig. 6—The Solar-Planetary Wheel, as viewed from the North: Positive matter is concentrated toward the center, and negative matter is diffused towards the rim—the rim being the common atmosphere of the system. The electric currents of the Sun drive positive matter in one direction and negative matter in the opposite. The solar negative current is receding and the solar positive is approaching us; and positive matter is circulating from right to left and negative matter from left to right in the upper semi-cycle. (See Figs. 15, 16, and 17.) Not drawn to scale.

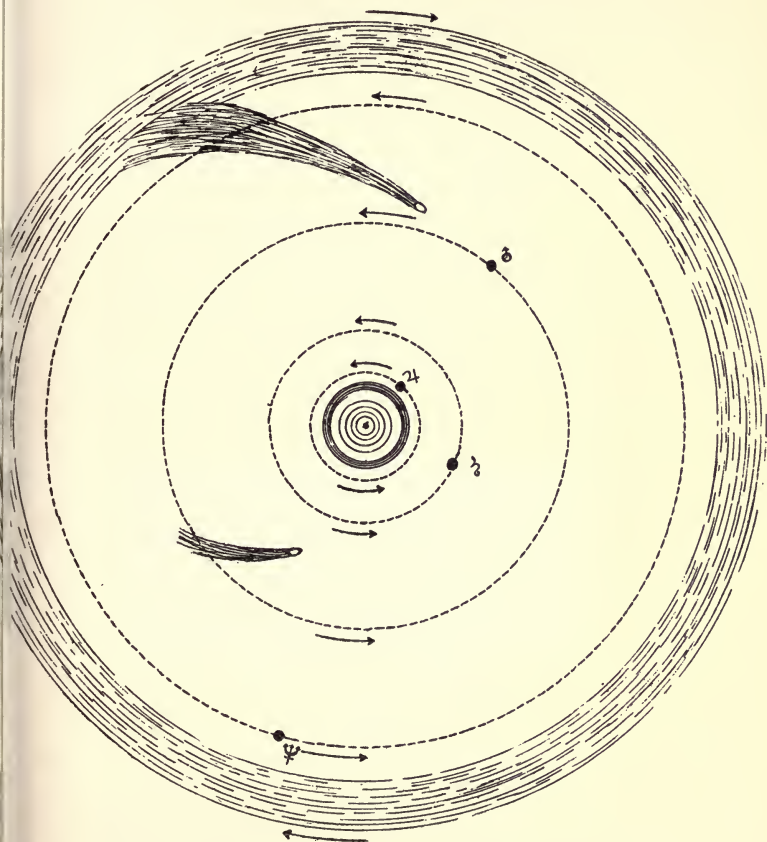


Fig. 6.

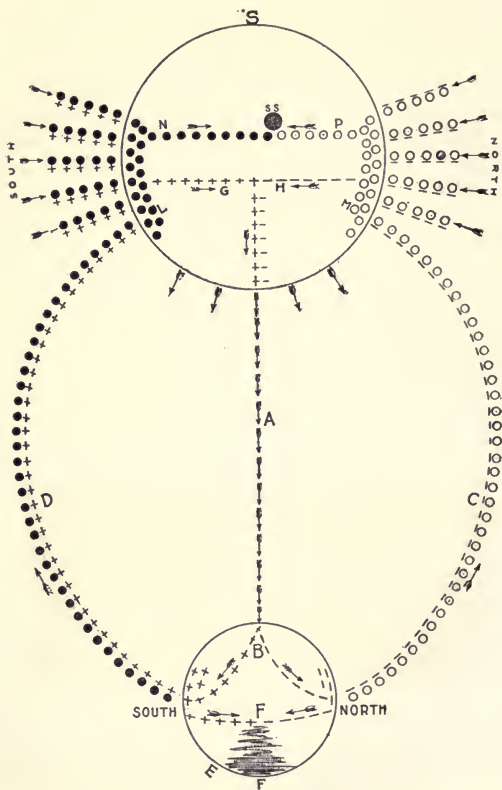


Fig. 7.

Fig. 7—A Cycle of Energy—S, Sun; E, Earth: A, heat and light emanating from the Sun dissociate into electric currents indicated by B; the latter emerg-

ing from the terrestrial poles as convection currents, respectively positive ions negatively charged, and negative ions positively charged indicated by C and D; the currents continue through the Sun as conduction currents, G and H; leaving uncharged ions at the poles of the Sun, L and M, positive ions at the north and negative ions at the south. The transformation of the currents G and H into heat and light completes the normal cycle. An ionic slip from the solar poles and an electric leak from the terrestrial poles manifest respectively as sun-spots, S S, and earthquake, F F'; the irregular lines denoting heat or earthquake waves, F the focal and F' the emergent point. The cyclic energy follows a thermo-electric circuit, the Earth being a thermo-electric cell, and the Sun an electrolyte.

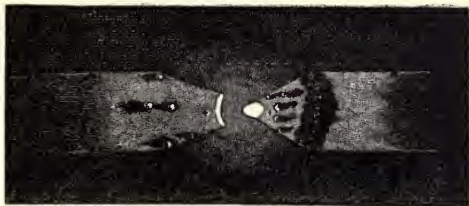


Fig. 8.

Fig. 8—Arc Light: Electrified ions pass from anode to cathode, tearing down the former and building up the latter. Similarly to the cathode the solar poles are built up. The terrestrial north is hollowed out by the escape of ions; while the terrestrial south is built up by a positive residuum.



Fig. 9.

Fig. 9—Aurora Polaris: A convective electric current from a pole of the Earth seeks a pole of the Sun, estimated to be seen as high as 600 miles.

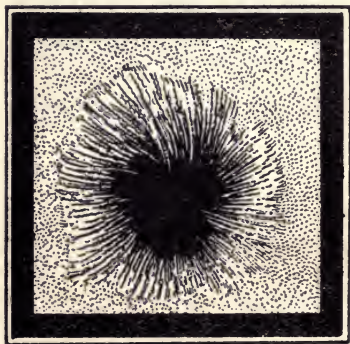


Fig. 10-A.



Fig. 10-B.

Fig. 10-A—Sun Spot: The dark part indicates pure ether set free by the neutralization of electric currents. B denotes a cross section of a heated metallic rod, the ether separating matter round the rod, and parting the air as it escapes upwards—a miniature sun spot.



Fig. 11.

Fig. 11—An Electrolyte: Free positive ions at the positive pole and free negative ions at the negative pole furnish polar potencies.

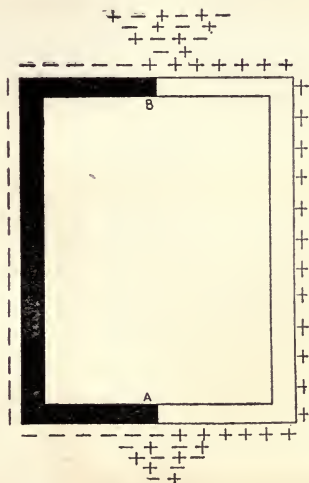


Fig. 12.

Fig. 12—A Thermo-Electric Cell: Heat applied at A is transmitted as electricity to B, and evolved as heat at the latter point. Compare the critical points indicated in this Fig. to those indicated in Fig. 7.



Fig. 13.

Fig. 13—Reactions of Electric Currents: Attraction of currents of the same and repulsion of those of opposite direction are shown. The arrows denote the direction of the whirl.

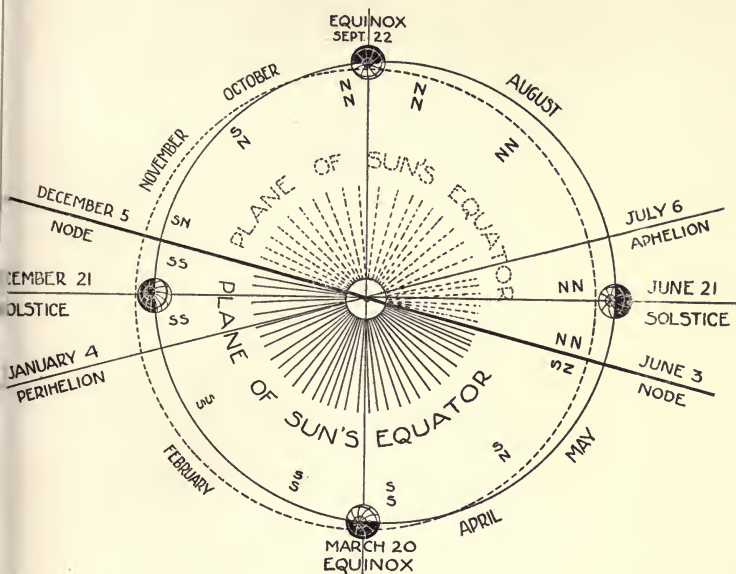


Fig. 14.

Fig. 14—The Terrestrial Orbit: The broken lines indicate Normal Circularity; the unbroken line the Earth's Orbit; the plane of the paper indicates the Plane of the Ecliptic; and the radiating lines the Plane of the Sun's Equator. The letters N and S denote the proximate poles of the Sun and Earth. The North Pole of the Sun points upward. The eccentricity of the Earth's Orbit and the points at which the ellipse cuts the circle are only approximately indicated.

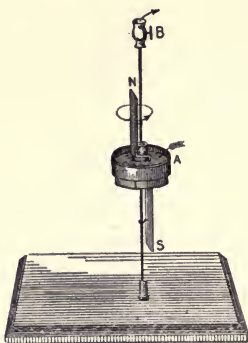


Fig. 15.

Fig. 15—Rotation within an Electric Field: The north seeking pole N revolves from left to right when the positive current passes from A to B. Matter as a simple transducer of force presents its neutralizing pole to the primary force. A body acted upon kinetically will present its positive pole to the acting force, whether that force is positive or negative (Fig. 3); although a counter force may disturb this rule.



Fig. 16-A.

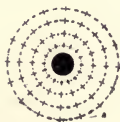


Fig. 16-B.



Fig. 16-C.

Fig. 16—Rotatory Direction: A shows the relative direction of an electric current and the induced whirl. The Fig. indicates the direction of the positive current and the direction of positive matter around it. Compare the directions with those indicated in Fig. 6. B shows induced field of electric current (cross-section). C shows a revolution of the ether round a current (longitudinal).

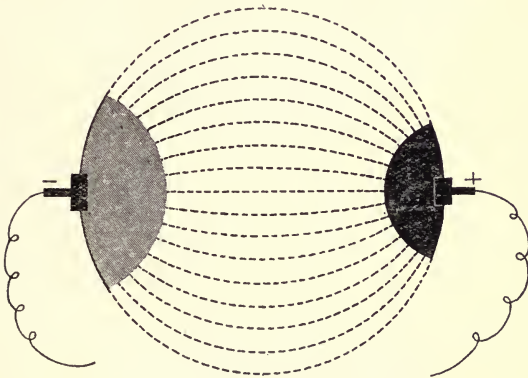


Fig. 17.

Fig. 17—Positive Concentrativeness: Differential clotting of blood at positive and negative electrodes manifest positive concentrativeness and negative diffusibility, as shown by the relative size and shades of the poles of the figure.

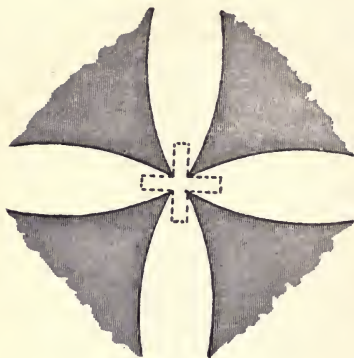


Fig. 18-A.



Fig. 18-B.

Fig. 18—Negative Diffusibility: A. The broken lines indicate the shape of the cathode, the rays from which diffuse under great decrement of pressure, and assume the form of the phosphorescent pattern. B. Electrodes of such relative size as to give maximum spark are shown, thus demonstrating a concentrative positive and a diffusive negative electricity.



Fig. 19.

Fig. 19—A glimpse through the Moon—A conception of her Distant Surface: Next to the Earth the Moon's conditions are favorable to the evolution of the organic cell.



Fig. 20. Ring Nebula in Constellation of Lyra.



Fig. 21.

Fig. 21—The Nebula Andromeda (from Mr. Robert's photograph): The figure shows a polar view of a great solar system.

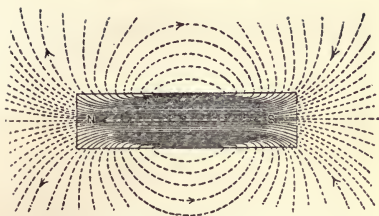


Fig. 22-A.

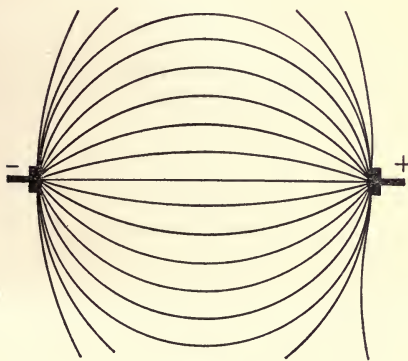


Fig. 22-B.

Fig. 22—Lines of Force: A shows magnetic lines, and B shows electric lines.

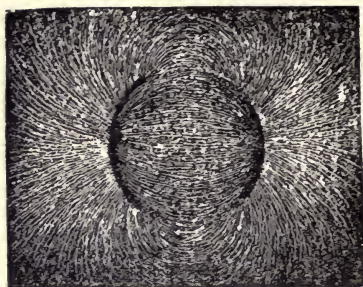


Fig. 23.

Fig. 23—The Earth's Magnetism: It indicates the induction field of the terrestrial body as a magneto-electrolyte.

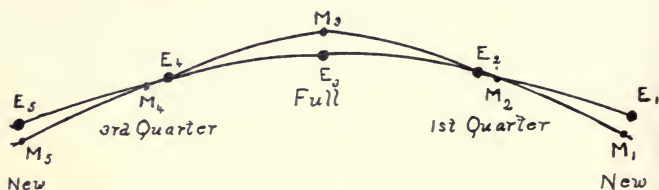


Fig. 24.

Fig. 24—Moon's Path with reference to the Sun (Young): The satellite always moves forward in its orbit round the Sun.

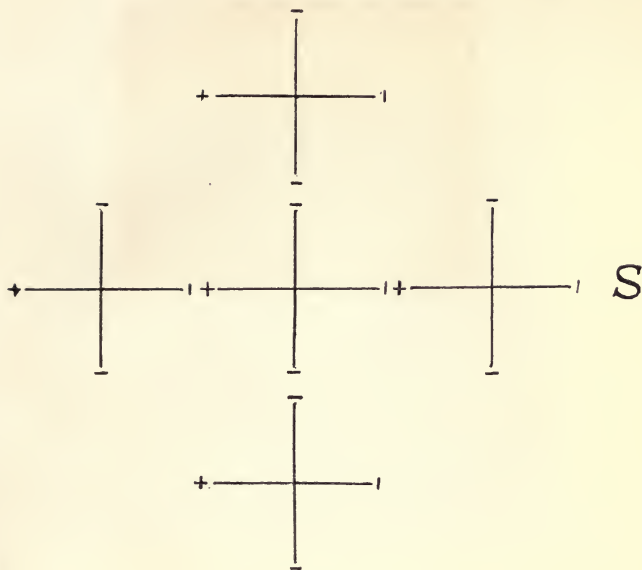


Fig. 25.

Fig. 25—Cosmic Concepts: If the perpendicular lines represent equatorial planes of Suns, the negative signs at the terminals of these lines will denote the anion qualities of the rims of systems. If the transverse lines represent polar planes of Suns, the plus and minus signs will denote the cation and anion qualities respectively of the north and south poles. It will be seen that the systems are in static equilibrium. The reaction between rims is one of repulsion up to the

point of establishing equilibration. The reaction between positive and negative poles is neutralization, but in the absence of a greater pressure the medium remains statically equilibrated. The reaction between positives is confined to the interior of the systems, and hence there are no kinetic forces exercised between the systems, although no doubt there is some neutralization. Kinetically each solar system of infinite space is independent unity, and the quantitative relation of all matter and all force to all space determines the dimensions of the plot allotted to each, and also the equilibration of the interstellar medium.



Fig. 26.

Fig. 26—Spiral Induction: The lines indicate the second phase in the spiral form of nebulae: N, the north or positive pole of an electrolyte; S, the south or negative. The upper line represents a primary electrolyte with currents in constant direction. The three lower lines represent bodies with induced polarities and which will assume the spiral form if circulating round the upper.

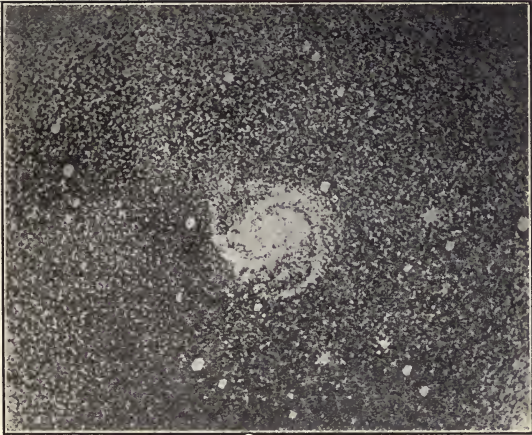


Fig. 27.

Fig. 27—Spiral Nebula (Roberts): We see here two planets in embryo and in cometary form, and evidently in circular motion. This means the presence of electric force, which implies a sun and at least one polar body as a planet.

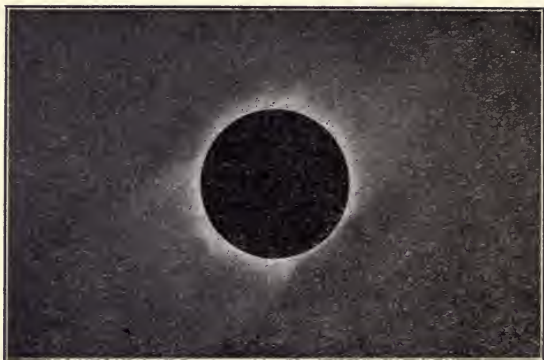


Fig. 28.

Fig. 28—Solar Eclipse: This indicates differential polar and equatorial radiations. Slight radiations manifest to the north and south. (By Chabot-Dolbeer Eclipse Expedition.)

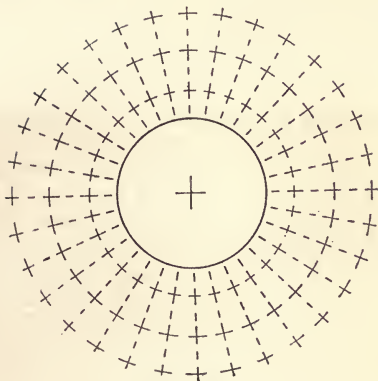


Fig. 29.

Fig. 29—Lines of Force: Consider the central part of the figure as representing a mass possessing a positive free force. Then it radiates lines of force (Faraday's) as the surrounding polarizations denote. The free force may be that of a molecule, or that of a Sun. If the free force is negative the induced polarizations will be reversed. Conceive the differential effects of these lines on negative matter which resists concentration and on positive matter which tends toward concentration, and conceive analogous effects of solar lines of force on the matter of the solar system.

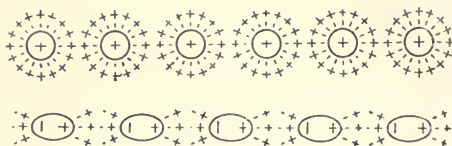


Fig. 30.

Fig. 30—Pax et Strenuitas: The upper figures denote forces in equilibrium. They represent positive and negative electric charges, insulated, and surrounded by induction fields. They represent molecules surrounded by induction fields or intermolecular spaces. They represent masses with their induction fields. The ether or other matter in the fields is shown as polarized inductively by the primary forces of the central masses. The lower figure denotes matter under strain. It represents the polarized, magnetic, or crystalline state. Each ponderable molecule and each ether molecule within the polar fields of the ponderable molecules, is shown as under a polarized strain.

It is important to note that an equilibrated molecule brought within the induction field of a polarized molecule will itself become polarized. This indicates the manner in which a crystal grows, and also the manner in which a wave is propagated in nerve or muscle tissue.

Mark: During polarization, in definite quantities, matter may be associated (1) by the primary molecules; (2) by the polar fields. During depolarization converse changes occur: (1) Dissociation by primary molecules; (2) dissociation by polar fields. Each change is an important factor in the initiation of specific phenomena.

Polarization and depolarization constitute true Vibration.

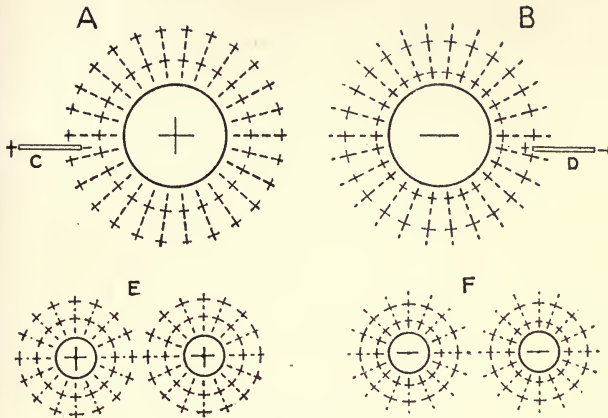
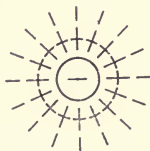


Fig. 31.

Fig. 31—Electric and Molecular Forces: A and B represent electrically charged bodies, surrounded by induction fields demonstrated by the conductors C and D. E and F denote ponderable molecules, the inner circles showing molecular masses, the plus and minus signs on which denote the qualities of the molecular free forces. The molecular masses are surrounded by fields of induction in which ether or other matter is polarized as in electric fields. The chemic union of E and F neutralizes the molecular free forces, thus setting free ether from the fields of induction. The freed ether is evolved as heat if it maintains its molecular character, as electricity if it is split up into atoms, or as light if it is corpusculated. Suppose the positive molecules E represent the solid matter of the earth. the negative molecules F the atmosphere, and that water and other elements essential to a chemical synthesis

are present at the boundary line. Radiant energy incident to the solid surface will be localized, and the pressure (intensity of, multiplied by the resistance to radiation), will be relieved by the construction of an organic cell-molecule. (See pages 98 and 104.)



CHAPTER XIV.

Light and Heat

The consideration of Light divides itself as follows:

1. The character of the initiatory impulse.
2. The character of the medium of travel.
3. The character of the organic cell which senses the disturbance.
4. The character of the element initiated, that travels, that is sensed, and that is the chief factor in the differentiation of phenomena in every crisis in the course of light.
5. The method of travel.

The Initiatory Impulse. It is necessary to define the character of a ponderable molecule: A molecule is the ultimate physical unit of ponderable matter, separable from surrounding matter by an intermolecular space, differentiated quantitatively by the number of constituent ultimate atomic units (ether atoms), and qualitatively by the relative number of positive and negative ether atoms in its constituency. All molecules are equilibrates sequential to the quantitative relation of all matter and all force to all space. A molecule may possess a free force of either positive or negative quality. The quantity of a molecular free force is directly proportional to the excess of either the positive or negative constituents over the other, and is inductively represented by the degree of polarization of the matter

within the intermolecular space. No interspaces exist within the molecular body (Fig. 31). All molecules are polarizable. Some molecules are neutral.

When molecules pass from the equilibrated state to the magnetic state and return to the equilibrated state they perform *True Vibrations* (Fig. 30). Such vibrations are accomplished by placing a piece of soft iron in an electric field of an intermittent current where it is magnetized and demagnetized perhaps a million times a minute. True vibration therefore possesses two phases, polarization and depolarization, such as occurs in crystallization and decrystallization, magnetization and demagnetization, contraction and relaxation of muscle, and rest and action of nerve.

In accomplishing true vibration certain quantitative and qualitative changes occur not only in the molecular masses, but in the molecular induction fields. A polarized molecule must possess symmetrical hemispheres and symmetrical polar fields, hence crystallization very essentially demands water of crystallization, and neutralization and muscularization the presence of a salt. These subsidiary elements may be designated *associating molecules of polarization*. Subsidiary elements when dissociated by depolarization of the principal molecule may become radiant matter. This explains the distinctive properties of radium.

Depolarization of the molecular body gives the initiatory impulse to radium radiations; and depolarization of the molecular induction field gives the initiatory impulse to light radiations. Radium and luminous matter during polarization associate their respective radiating matter.

2. *The Character of the Medium of Travel.* Ether is a perfect medium for the transmission of force. Its imponderability, its non-cohesiveness, its polarizability, the complete immolecular neutralizability of its forces, together with its perfect equilibrium as to the quantitative relation of all matter, and all force, to all space, allow ether to be a perfect medium, transmitting force influences without loss of energy, with minimum resistance and maximum velocity.

Ether transmits gravitational forces and is therefore subject to the action of such forces, but the quantitative relation of all matter and all force to all space sequential to the action of the forces of diffusibility require space to be occupied to the limit of molecular conditions. Hence ether is imponderable. On entering a molecule of ether a force meets resistance but on leaving the molecule the traveling force will be hastened by the effort of the ether molecule to regain its equilibrium. Hence there is no loss of radiant energy.

The ether molecule is self neutralizable because its positive and negative matter—atoms—are of equal quantity, of minimum size, and neutralize at minimum distance and by maximum contact, hence according to the law of distance its matter is the least subject to the extrinsic concentrating forces.

The ether is non-cohesive as the circumferential matter of its molecule is negative in quality, thus according with the relative arrangement of the positive and negative matter of the universe.

Ether transmits the corpuscle of light intact from its emission to its absorption, exacting no toll either in material or energy, preserving its exact character, and only modifying the corpuscular form when the medium itself is dominated by forces of ponderable matter.

3. *The Character of the Organic Cell Which Senses Light.* The organic cell is a molecule in construction, with a central body surrounded by an induction field—intermolecular space. The central or molecular body is the nucleolus wherein resides the inductive force or energy of the cell.* The nucleus is the induction field of the nucleolus. The cell-molecule is polarizable and associates additional matter essential to the polarizing act. Specific quantities of matter are necessary to polarization in order that the cell-molecule possess uniform hemispheres and uniform polar fields. A cell may be a neutral body and without an induction field.

There is no well defined limit to the size of molecules. Under a maximum ponderable pressure a mass may be conceived as being without molecular division. The elements engaged in building up molecules of the type of nucleoli appear to be: Specific degrees of temperature (ether pressure), and of ponderable pressure, and the presence of the essential chemical elements. Increased temperature will raise the ponderable pressure if there be resistance to the escape of radiant energy, and this resistance is a factor of great importance in constructing a cell-molecule—cell association occurs in bone marrow, and cell dissociation in splenic tissue. There is thus indicated a function of the sclerotic coat of the eyeball in preserving a degree of pressure essential to the maintenance of the highly potentiated cell-molecule which senses light.

The physiological appreciation of light depends on optic cells, during the polarizing phase of a true vi-

*In a monograph—The Physiologic Unit—the facts relative to the conception of the nucleolus being a molecule were fully considered.

bration, associating ether of polarization. The physiologic molecules may be said to be the complements of the emitting molecules, and can only vibrate when stimulated by specific quantities of unequilibrated ether as corpuscles. The absorption of specific quantities of ether by physiologic molecules during the polarizing phase of a true vibration is somewhat analogous to the absorption of water of crystallization. The corpuscle of light is to the molecular polar field what water of crystallization is to the crystallizing molecular body. The absorption of water or of a salt symmetrizes the polarized molecular hemispheres; and the absorption of corpuscles of ether symmetrizes the molecular polar fields; thus the cell molecules of the optic nerve assume uniform polar fields and are thus capable of performing true vibrations—functionally appreciating the incidence of light.

4. *The Character of the Essential Element of Light.*

It is corpuscular. Newton was right. Unfortunately he had to deal with the subject exclusively by the inductive method of reasoning without the aid of deduction from an hypothesis capable of scientific generalization. Huygens was also right but in a less degree. The corpuscle is propagated in wave form, but the element of light emitted at its source, the element absorbed and sensed by the eye, and the element engaged in every crisis in the course of light is corpuscular as Newton maintained.

One of the most important of the subsidiary changes connected with the true vibration of a molecule is the emission of ether from a polar field during depolarization. If an equilibrated or depolarized molecule be neutral, and hence without an induction field, it is clear that it will absorb ether during polarization and emit

or radiate the same during depolarization. The ether within the field of an equilibrated molecule having a free force is not emitted from the molecular system during depolarization. But every molecule has a constituent base which is neutral and polarizable; and every molecule when vibrating will absorb and emit ether according to the inductive force of the poles of its neutral base. Obviously every molecule emits ether at both poles when depolarizing, the quantities emitted being equal to each other, and their sum being equal to the amount absorbed. A molecule with a free force may become neutral by dissociating, instead of associating matter during polarization. In this manner cell-molecules multiply.

In specific cases the emitted ether is the corpuscle of light, whose initiatory energy is the energy of molecular depolarization, and whose corpuscular quantity is the essential of color. The frequency of vibration and the length of the luminous wave (from crest to crest) are incidental, and conform to the time consumed by the initiatory molecules in performing a true vibration. Although specific frequency (intensity) and specific length may be modifying factors in producing certain luminous phenomena they are not the essentials in differentiating color. The propagation of light through the ether as modified by ponderable force, its reflection, its refraction, its absorption, its diffraction, its polarization, and every crisis in its course, depend on the specific quantity of the corpuscle. In its propagation through unmodified ether light maintains its corpuscular unit, and is without crises or events.

The corpuscles of color differentiate in size, the red being the largest, and decrease in quantity occurs as the violet is approached. Besides the primary color cor-

puscles there are undoubtedly various combinations of specific quantities which are normal excitants to the optic cell molecules. Ultra violet and ultra red corpuscles do not agree in quantity with the essential associating corpuscles of the optic nerve, and hence are non luminous.

5. *The Method of Travel.* Within the molecular induction field of the initiatory molecule the corpuscular quantity is polarized, and hence condensed. When set free from the induction field by depolarization of the primary molecule it is itself depolarized, and expands in seeking equilibrium. It therefore strikes against surrounding ether and a quantity equal to the original corpuscle is condensed. This last quantity seeks equilibrium, strikes against a successive quantity, and so the corpuscular quantity and the condensed energy is propagated. The initiatory corpuscle when liberated moves forward and hence has a displacement action. Hence each corpuscular wave is compressed from behind and expands to the front, thus possessing a displacement movement. Luminous waves are pressural, compressional or condensational. They are longitudinal.

The longitudinal direction is fundamental to all wave motion. The transverse is a modification in the direction of least resistance. It is a surface wave. It starts out as a longitudinal wave and would continue as such if surface conditions did not furnish another direction of less resistance. The ether has no such surface conditions.

The luminous wave crest is comprised of corpuscles which are simply condensed quantities of ether. What is the condition of the ether between the crests? Can the ether be rarified below its normal equilibrium so as

to create a negative phase, capable of neutralizing its positive phase?

The relation of ether to space and to the forces of the universe allows it to equilibrate as the most rarified form of matter. In the construction of its molecule the negative matter is circumferential to central positive matter, a relationship which favors diffusibility. Ether equilibrates under the minimum pressure of the universe.

Now mark: A corpuscle of light receives its pres-sural blow from behind, moves forward and condenses, delivers its blow in front and rarifies. In the meantime the ether behind it is condensing. Hence our particular corpuscle is rarifying between two condensing bodies—the body behind is approaching it but the body in front is departing. We can conceive that under such conditions the corpuscular quantity may rarify by its intrinsic forces below the normal equilibrium.

According to the accepted theory a crest and a trough will explain the phenomenon of interference. However, the available facts connected with interference phenomena are not altogether satisfactory. It might be well that the temperature of the bright and dark areas in experiments be ascertained. If the crest and trough theory be correct there should be no rise of temperature in the dark areas.

We will approach the subject of *Interference* from another direction. Within a given area occupied by ether, say between the Sun and Earth, there are X number of luminous waves. If this ether field were undisturbed the ether would be in Y equilibrium. One might argue that when occupied by X condensations above Y equilibrium there must be X rarifications below

Y equilibrium. But further, as it takes light 8 minutes to traverse the field from the Sun to the Earth, and as the luminous waves have forward displacements there have actually poured into the field X number of corpuscles in 8 minutes, before any depart from the field on the opposite side. The field is therefore packed to the extent of X corpuscles, and there are X condensations without any rarifications below the Y equilibrium. Then we will advance this consideration as an interference sequence: When two corpuscles conjointly strike the optic cell molecule, so as not to be physiologically separable, they block the polarizing function of the molecule and darkness results, just as if they were an ultra red corpuscle. If the two corpuscles vary in period or orientation one may act physiologically and the other be spent as heat. The first condition is interference, the second non-interference. Thus accordingly interference is physiological. Whether interference is physical or physiological should be proved by experimentation.

A study of molecular fields will show that their ether must have different degrees of polarization and hence different degrees of density, according to the potentiality of the free force of the molecule. We will postulate thus: Each color corpuscle entering a molecular field must displace ether of a density equal to or less than its own. The color corpuscle will be refracted according to the curve of the path of its particular density.

The color corpuscles from red to violet undoubtedly present a gradual uninterrupted decrease of density. The molecular induction field also presents a gradual uninterrupted decrease of density from the surface of the molecule outwards. The beginning and the end of the molecular fields may possess any degree of density from

the greatest of which ether is capable to extreme tenuity. Thus the selective action of certain media is explained.

Molecules of rarified media, such as air, possess large and tenuous fields and transmit white light without dispersion. Thus corpuscles are transmitted by fields of a density equal to or less than their own, but are blocked by a field of a greater density. Each corpuscle is whirled round a molecular body by displacement as a cometary particle is whirled round the Sun by convection. Each cometary physical unit or each light corpuscle moves in a straight path until reaching its particular density curve which it follows. Hence molecular fields *transmit* or *reflect* light according to the character of their density lines.

It is apparent that the curvatures and the length of the lines of density are greater the more distant they are from the molecular polar surface. The curvature of the density lines of molecular fields as media of light accounts for *refraction* phenomena. The differential curvatures of the color lines of the molecular polar field or the molecular field distorted by pressure, account for *dispersion*.

A molecule by its intrinsic forces assumes the spherical form. The molecular induction field is also spherical as to its density lines. Pressure may modify both molecule and field. When polarized the molecule will still be spherical and the polar fields will be hemispherical. It will thus be seen that a corpuscle emerging from a molecular field will not be simply a round bunch of ether but will be elongated and perhaps of semilunar form. The elongation is transverse to the direction of propagation. But, there is no similarity in the orientation of the transverse direction. When the corpuscles are similarly orientated they are said to be *polarized*.

Rectilinear propagation follows when the medium is imponderable and non-cohesive, the slight diffraction resulting from an elastic corpuscle and manifesting according to the corpuscular quantity. Ether is the only luminiferous medium but it may be traversed by density lines caused by the transmission of force from ponderable matter which modify and render it a selective medium.

Light is limited to certain color corpuscular quantities which are physiologically distinguishable. Pulsations exist in the ether which have all the qualifications of light excepting the distinguishable corpuscular quantities. These are demonstrable by instrumentation, and are dark corpuscular radiations. Light has only physiological delimitations. The thermic value of light is directly proportional to the quantities of its corpuscles. Pressural waves or pulsations and non-pulsating streams of ether beyond the boundaries of light are physiologically appreciated as heat. Ether unequilibrated is heat, which, when specifically corpusculated, becomes light. Light is qualitative and quantitative; heat is simply quantitative.

It is apparent that any reaction of a chemical character between molecules will modify the molecular induction fields, thus setting free masses of ether which radiate as heat (Fig. 31). It is also possible that in some cases these masses may conform in quantity to light corpuscles. Again unequilibrated ether radiating as heat may encounter molecules capable of true vibrations, and thus the heat will be converted into light, as witness sodium placed in a flame. The sodium molecules or their ions, polarize, absorb ether within their induction fields, depolarize and radiate their distinctive color corpuscles.

CHAPTER XV.

ADDENDA.

Fundamental Hypotheses and Immediate Deductions.

A RESTATEMENT.

1. The matter of the universe is composed of two ultimate units, cosmically of equal quantity, and qualified as follows:

- (a) The positive, condensative, ponderable, center seeking, rest inducing, anode unit.
- (b) The negative, diffusive, imponderable, center fleeing, motion inducing, cathode unit.

Impenetrability is a property of both units.

2. A positive unit and a negative unit mutually neutralising at minimum distance and by maximum contact constitute a molecule, the basic element of the simplest form of matter termed the *Ether*.

3. One negative unit intimately united with two positive units constitute an indivisible entity which is the binding force and basic element of all complex, ponderable or sensible matter, and which when molecularly free, as in electrified partial vacua, electrolytically seeks the cathode, and hence has been designated the "cathode particle," although predominantly anode in character.*

4. When under the strain of extrinsic force ether molecules undergo chemie analysis their atomic or ultimate units superficially associate with the complex form of matter, and manifest as electricity. In electrified partial vacua the cathode particle is an electric cathode

*The following terms introduced by Farraday have confusing

unit carrier, and as such seeks the anode, the point of neutralization; but also manifests an independent property of diffusibility. The positive cathode particle is thus dominated by the negative electric charge. Thus by the chemic dissociation of ether the ultimate units pass from the lowest to the highest potency of matter.

LAWS OF PRIMARY FORCES.

As deductions from the foregoing hypotheses, and as an interpretation of sequential facts, the following laws of the primary forces of matter are formulated:

1. Each particle of positive matter attracts every other particle of positive matter, within its field of neutralization, with an intensity inversely proportional as the square of the distance.

2. Each particle of negative matter repels every other particle of negative matter, within its field of neutralization, with an intensity inversely proportional as the square of the distance. The neutralization field may be the area of a molecule or that of a solar system.

3. Each particle of positive matter and each particle of negative matter strain to mutually neutralize by maximum contact and at minimum distance. By this law ponderable matter diffuses until the "cathode particle" is reached.

significance:

ANODE, the positive pole or its ultimate electric constituents.

ANION, anode particle, the negative element electrolytically evolved at the anode.

CATHODE, the negative pole, or its ultimate electric constituents.

CATION, cathode particle, the positive element electrolytically evolved at the cathode.

ANIONIZE, to render more negative.

CATIONIZE, to render more positive.

FURTHER DEDUCTIONS.

As two of the three laws are effectively diffusive, it follows that all space is filled by matter, consequently there is a certain relation of all matter and all force to all space; and dependently upon such relation matter assumes mass formations. Masses are evidences that all space is occupied by matter, and the quantitative relation of complex matter to ether is determined by the relation of matter to space; which also determines the quantitative content of the ultimate unit.

The solar system is a cosmic unit constituted of equal quantities of positive and negative matter, which, according to their properties, possess a certain amount of unequilibrated force, which is constantly gaining equilibrium by causing an equal unequilibrium. Hence a perpetuity of cycles within the system.

Solar systems occupy relative positions induced by the relation of all matter and all force to all space, and the spatial relation is upheld by the repulsive properties of circumferential negative matter. Interstellar repulsion induces a movement among the stars, which, in the absence of a resisting force, is eternally continuous throughout an infinite space. The motion of each star is counteracted by the motions of other stars, so that the universal equilibrium is maintained.

In electrified partial vacua the "anode particle" is an aggregation of negative matter intrinsically bound by cathode particles, and extrinsically herded by the induction fields of other cathode particles. In addition gravitational (positive) lines of force pervade partial vacua with binding effects.

The analogue of the cathode particle consists of two negative units and one positive unit, and this as an

entity undoubtedly exists at the extreme limits of the solar system, where positive radiations terminate, and which neutralize and bind the dissolving constituents of this particle.

No motion takes place of the molecule, atom or sub-atom but is demonstrable in the mass. The constituents of a molecule are relatively at rest, in equilibrium, except when disturbed by external force, or conditions. The vibrations of molecules are limited to two movements: 1. A polarizing and depolarizing movement. 2. A condensing and rarifying movement.

Heat is a manifestation of the diffusive qualities of complex matter in the presence of unequilibrated ether. The basic element of light is a corpuscle of ether which is propagated in wave form—the theories of Newton and Huygens combined.

MATTER, SPACE AND TIME, ASTRAL MOTION.

Matter being diffusive it must be coextensive with space, and as space is infinite hence matter must also be infinite. The relation of all matter and all force to all space permits a specific minimum pressure in the ether, the state of which is the ultimate of diffusibility. Based upon the minimum pressure under the relation of matter to space, and upon the distinctive properties of its positive variety, matter assumes the solid, liquid, and gaseous forms. Thus these forms are conclusive evidences that all space is occupied consistently with a pressure which allows the ether to exercise its properties. The only empty spaces in the universe are the intermolecular spaces of ether (Fig. 1). Clearly, the law of gravitation, being a minority law, is effectively dependent upon mat-

ter occupying all space under a specific degree of minimum pressure.

Time is eternal, and as matter could not have been formed from nothing, it must be co-existent with eternity. Marked time indicates the evolutionary phases, or their details, of cycles induced by the properties of matter, the cycles being eternal in their repetition. Matter and its fundamental properties, and various sequential manifestations, are co-existent with time and space.

It must be borne in mind that positive and negative matter tend to a universally relative placement—the positive matter central and the negative matter circumferential. Thus distinct bodies of positive matter have negative atmospheres; and thus the ether molecule and the solar system are constructed with circumferences of negative matter. Within our system positive matter by its concentrativeness, in general, is advantageously placed to be acted upon by internal gravitational forces; and negative matter, coördinately, is advantageously placed to be acted upon by extraneous or interstellar forces. Hence any reaction that could occur between the solar system, in its present evolutionary development, and an approaching star would be one of repulsion.

The forces of each solar system are completely and intrinsically neutralized, but they vary in the manner of neutralizing as the system traverses the evolutionary phases of its eternal cycles. When a solar system is in its utmost nebulous condition its constituent elements are intimately neutralized, and there is a minimum of central positive solidity, and hence a minimum of negative matter in its circumferential or common atmosphere. When central solidity of positive matter has reached its maximum, the circumferential negative matter must also attain a maximum degree. Our solar system is traveling

towards the latter phase of evolution, and a strong repulsive force would meet any star approaching us. On the other hand the repulsive reactions between nebulae are slight, and mutual approachment may eventuate.

We will suppose that two nebulae by intrinsic diffusibility are in proximity. As evolution occurs they will exercise a mutual repulsion which will impart to each a movement to which no resistance is offered in interstellar space. According to the Newtonian law these bodies will move forever. Each will move in a straight line until it approaches another system, similar to our own, when the negative lines of force will be bent (Fig. 5) and the contact will impart a momentum to each body that will send it spinning through space. The motion of stars in space thus depends on repulsion between negatives; and the impenetrability of like fields. Notwithstanding the motion the relative position of stars is governed by the relation of all matter and all force to all space, and this fact in itself prevents stars from colliding. A slight mixing of nebulae does no harm.

The distance of Neptune from the Sun is given as 2,790,000,000 miles. Beyond Neptune the common atmosphere of the system, owing to its extreme diffusion, probably extends to over 5,000,000,000 miles from the sun, and this indicates the longest diameter of the system—10,000,000,000 miles. Alpha Centauri, the nearest star to the solar system, is stated to be 25,000,000,000,000 miles distant, which is probably 2500 times greater than the longest diameter of our system. If the longest diameter of the solar system is represented by one inch, the interstellar space referred to may be estimated at about 200 feet. Sirius, the next star to Alpha Centauri, has an estimated distance of twice that of the latter. Nature is evidently abundantly liberal, even prodigal as regards space, and this is a provision of safety against collision.

THE LAW OF GRAVITATION.

If the formula of the law of gravitation as at present accepted were correct the matter of the universe would be collected into one mass, as however great the distance between stars they have had an infinite time for mutual approachment. There would be no motion, no momentum, except in the direction of approachment.

Nature does not make such mistakes as to place itself under such a law as that of gravitation as at present promulgated. Nebulae may mutually approach by the forces of diffusibility, or their outward boundaries may even coalesce, but no astral body of matter can strike a system such as ours in its present phase of evolvment. The isolation of the solar system is complete and is maintained by: *First*, the equilibrium induced by the relation of all matter and all force to all space. *Second*, the relation of ponderable bodies to the vast bounds of ether matter. *Third*, the universally relative placement of positive and negative matter. *Fourth*, the absolute restriction of gravitational force to the internal reactions of the system. *Fifth*, the impenetrability of like induction fields. (Figs. 3, 4, and 5.)

THE GREAT CYCLE.

In the extreme nebulous state electric currents are absent, and heat ceases to radiate throughout the system from a central body (page 54, Fig. 7). The great cycle, metaphorically speaking, has reached aphelion. The main features in the critical change are the maintenance of positive concentrability, and the cessation of thermo

electric, solar planetary, cycles of energy. The great cycle may be divided into two phases. The first is one of concentration, simultaneously starting from numerous independent centers in the nebula, and supremely continuing until thermo electric energy is re-established. During this period heat emanates from the numerous contracting centers, and is absorbed by the more diffusive elements.

The second phase has complex features. The sun regains dominance and ultimately sends a blanket of concentrating force over the whole system. Coincidentally thermo electric energy pervades the system, streams of electrified ions emanate from the poles of planets and enter the poles of the sun, thus ionizing his mass, and increasing his volume, until he embraces the planetary system. In the meantime planets contract in volume by loss of ions, become more positive by solar gravitational force squeezing out negative matter, their polar potentials decrease, and their orbits contract until they are engulfed by the sun. As the solar forces increase new planetary bodies are condensed, as beyond Neptune, and they in turn are absorbed by the sun. Then the whole common atmosphere forms the circumference of the solar body. It is thus that nebulosity is resumed, and one turn of the great cycle is accomplished.

It must be clearly comprehended that according to two of its three fundamental laws matter is diffusive, and that the strain to neutralize by maximum contact becomes effective, through heat and electric energies, in the central body. Yet the condensing or gravitational forces within the solar body are still active and it is by these forces that heat radiates from the sun. A sun spot illustrates the activities of solar energies. The appearance of a sun spot is caused by unequilibrated ether as

heat, which is a result of energy absorbed at the solar poles; the disappearance of a sun spot is caused by the contracting properties of positive matter. The sun absorbs more ionic and electric energy at his poles than he emits in the form of heat, and the retained energy adds to his diffusibility.

The volume of all the planets is small in comparison to that of the sun, but it must be conceived that they were condensed from that part of the nebula occupying what may be called the planetary space, and when absorbed by the sun they will do nothing more or less than occupy the same relative space. In the intimately neutralized state of extreme nebulization the potential force of the system resides in the concentrativeness of positive matter; in extreme consolidation of positive matter and coördinately extreme diffusion of negative matter the potential force resides in the neutralization strain of both varieties; and so the pendulum eternally swings between the differentiated foci of the great cycle.

CHAPTER XVI.

Mars.

Some astronomical observations favor the conclusion that there is no water in the atmosphere of Mars. From the position of this planet in the solar system, and from the evolutionary stage of its development the conviction follows that the polar caps of the planet are evidences of snow and ice. Observers have not taken into account the action of solar gravitational lines of force on water, which is relatively driven towards the pole distant from the sun. It is evident that the solar action on the water of Mars will clear the atmosphere on his surface approximating the observer. The fact of mountains being absent is favorable to this solar action on water. The mountains on the earth obviate this action of the sun's forces on the water of the terrestrial surface. Notwithstanding an observer, situated on Mars and taking a look through the air covering some of our deserts, might be mistaken as regards the presence of water on this planet. Furthermore in the atmosphere of Mars water may not exist as cloud, but as ions, or atoms in molecular form.

Mars has two satellites. Phobos, the inner one, revolves in its orbit in 7 hours and 39 minutes; and Deimos, the outer one, has an orbital period of 30 hours and 39 minutes. Mars takes 24 2-3 hours to complete his axial rotation. A stone on the surface of this planet takes about four times longer to rotate around its center of gravitation than Phobos does. The explanation of this peculiarity is as follows: Mars rotates on his axis as a ball on a floor, the floor being the solar gravitational lines of force, which, acting on the proximate surface of

the planet, exercise a retarding influence identical to what the floor exercises on a rolling ball. The satellites rotate in their orbits in obedience to the electric currents of Mars.

THE MOON AND ITS ATMOSPHERE.

Every distinct body of matter in the solar system has an atmosphere. The comet's atmosphere is its tail. The earth had a tail once, and it got rolled round the terrestrial body when axial rotary motion was assumed. The atmosphere of the sun is its photosphere or chromosphere, and its south pole may have a tail. Mars and outside planets at their south poles may have remnants of tails. The earth's tail is a mountain ten thousand feet high. Bodies without axial rotary motion have their atmosphere driven by the lines of force from their principals to their distal sides. Thus the atmospheres of comets are always on the sides of the cometary bodies distant from the sun. The moon has no axial rotation as regards its principal, the earth, hence its atmosphere is driven to the distal side.

Do the conditions admit of the moon's atmosphere being demonstrated? Yes, decidedly. In a total eclipse of the sun two repelling forces from exactly opposite directions act on the atmosphere of the moon—the lines of force of the sun and those of the earth. Both forces attract the body of the moon, but relatively repel its atmosphere. The result of the actions of the two forces is a depression of the higher atmosphere of the moon and a uniform bulging of its middle and lower atmosphere. The grand result of this atmospheric bulging during a total eclipse of the sun is the refraction of the sun's rays which in straight lines would be absolutely ob-

scured. Hence the magnificent sight, *The Corona*. The spectrum of the corona is that of incandescent gas which of course belongs to the sun. The light is refracted without essential change. However, the analysis of coronal light points to an unknown substance referred to as coronium. Every molecular element is in equilibrium according to surrounding ponderable pressure, temperature, etc., and it is conceivable that some of the numerous unknown elements between the cathode particle and the hydrogen atom may exist in the moon's atmosphere. This element may emit light under the influence of the sun's rays. From a study of the conditions in Mars, the author concludes that both water and air exist on the moon's opposite side.

During crescent moon the sun's forces bend the atmosphere of the moon but in this case the sun's forces act on the upper atmosphere which no doubt is rare and incapable of detection. During full moon the actions of the sun's forces are in the same direction as those of the earth.

THE PLANET MERCURY.

Of all the planets, asteroids excepted, Mercury has the least mass, the smallest diameter, the most eccentric orbit, the greatest orbital inclination to the ecliptic, the greatest orbital velocity, and the greatest difference between perihelion and aphelion velocity.

It may be pointed out that the ecliptic is unstable as a standard measure; whereas the plane of the solar equator is stable relatively to the solar system, and in a degree relatively to the equatorial planes of all systems, and thus the inclination of planetary orbits should be given as related thereto.

In explanation of the facts we will suppose that Mercury, when evolving from the nebulous condition, was condensed within the equatorial plane of the sun. When the sun's electric currents were evolved the planet assumed the spiral form, with its head towards the north pole of the sun. Following this it commenced to roll on its axis, and its tail took on an atmospheric form. The conditions ensuing are: A central electrolytic body with electric currents in constant and definable directions; and a planetary electrolyte, with electric currents in opposite directions to those of the central body. The planetary revolution conforms to the general law of electric whirl, the formula of which has already been given (page 47).

Now when the planet is north of the plane of the sun's equator, there is intense attraction owing to the propinquity of the two positive bodies, and this is intensified by the presentation of the north poles. Thus the near approachment of planet and sun is accounted for at perihelion. When the planet is south of the solar equatorial plane there is an intense reaction of repulsion which sends it to a relatively greater distance from its revolutionary center, as at aphelion.

These results ensue from the combined causes of the static forces of the two bodies, manifesting as attraction and repulsion of strictly lineal character, and of their electric currents manifesting in the orbital revolution of the smaller body. The sequential order of the conditions as affecting Mercury are: Propinquity, great and differential orbital velocity, eccentricity of orbit, and inclination of his orbital plane to the solar equatorial plane. When we study the causes of the lineal and circulatory reactions between the sun and Mercury it is apparent that they are constantly undergoing modifications, which

are accompanied by changes in the relations of the two bodies.

The equilibrium of Mercury, as that of all other bodies, is maintained by the relation of all matter to all space, with modifications produced by local causes. The reactions between the sun and Mercury may be classified as follows:

Attraction between two positive bodies, acting throughout the orbit.

Attraction between poles of opposite potential, when presenting.

Repulsion between negative poles, when presenting.

Repulsion resulting from impenetrability of like induction fields, when presenting.

Repulsion between electric currents of opposite direction, acting throughout the orbit.

Momentum acquired by the body in an electric whirl and which is favorable to repulsion throughout the orbit.

Solar attraction of Mercury is increasing in that part of his orbit from aphelion to the equinox (Fig. 14) and in a less degree beyond, but is opposed as perihelion is approached by impenetrability of like induction fields. Thus flattening of this part of his orbit is produced. Attraction is opposed by momentum.

The repulsive forces acting on Mercury in the orbital portion leading to aphelion hold their own with the exception of the reaction between the two negative or south poles. The decrease of this reaction flattens the orbit at the equinox following the perihelion. Differential flattening of the orbit at the equinoxial points will cause twisting of the longest diameter.

The mass of Mercury increases in positive character with an evident decrease in his polarities. Mercury in his dotage approaches cometary conditions. The loss in rotary motion and loss of his negative atmosphere are indications of these changes.

There is an unsolved mathematical problem relative to the orbit of this planet. It is evident that mathematics to be valuable in the solution of problems must be based on undoubted factors, and these must undoubtedly cover the whole field. It is futile for even great mathematicians to attempt to solve problems such as those of the orbit of Mercury, on the lone factor of gravitation. It is worthy of notice that even when the mathematical formula is correct the principles assumed may be incorrect.

Gravitational force between two predominantly positive bodies, in electrolytic form, one of which is in orbital revolution, may be likened to an elastic band, which contracts when only opposed by momentum, and the influence of electric currents of opposite directions; but stretches when additionally opposed by repulsion between negative poles, and impenetrability of like induction fields.

METEORS.

Meteors are small comets, and what has been said in this work concerning the latter (page 128) applies to the former, with a few exceptions which we will note. Meteors are more positive than comets and hence get entangled with the solar and planetary induction fields. Having lost their predominating negative matter they partake of the character of metallic substances.

It has been calculated by See that the quantity of meteoric matter falling into the sun is sufficient to cover the solar surface to the depth of two meters in 100 years, if the matter were of the average density of the earth, and which would equal the total mass of our moon. Our deductions agree in principle with this statement. *The sun grows* (page 54).

It has also been stated that hot weather, immediately caused by increased solar radiation, is ultimately caused by meteors falling into the sun. This statement will not stand critical investigation. Meteoric matter piercing our atmosphere may produce heat by contraction of its mass as it approaches the earth's surface. But if a meteor is dissolved into gaseous elements by the sun's thermic force, it will absorb heat. A meteor striking the solar surface has two forces bearing on it: The intense gravitational force having a contracting influence; and the intense heat having a diffusing influence. By the former a slight amount of heat might be emitted, but it must be considered that a maximum condensation in the meteoric substance has been approached before reaching the solar surface.

CHAPTER XVII.

Radiant Energy.

RAY'S FROM ELECTRIFIED PARTIAL VACUA.

A glass tube is exhausted to a degree approaching a complete vacuum of its gaseous content—a residuum must be left for the purpose of electric convection. The tube then contains two elements, the “cathode particle” which theoretically we have constructed of two fundamental units of positive character, and one of negative character; and an aggregation of negative matter termed the “anode particle” in a measure intrinsically bound by cathode particles, and extrinsically herded by the induction fields of other cathode particles. Quantitatively the cathode particle is related to the anode particle as 1 to 1700, the latter approaching the size of the hydrogen atom.

The cathode particles within the tube are reached by the dissolving properties of the residual gas, be it oxygen, hydrogen, carbon dioxide, etc. The cathode particle is the ultimate ponderable and binding unit of the molecules of these gases, whether it be positive hydrogen or negative oxygen. It is clear that a tube completely exhausted of its ponderable content is still permeated by the concentrating or gravitational lines of force of the earth superinduced by those of the sun. No ponderable substance could withstand its own dissolving properties within a space in which all matter and all force were otherwise excluded. The material of the tube would dissolve into cathode particles and ultimate negative elements.

When a partial vacuum tube is electrified the cathode particle, being positive, electrolytically seeks the negatively charged cathode; and the anode particle, being negative, electrolytically seeks the anode. The cathode

and anode particles become electrified, the first negatively, and the latter positively, at their respective poles.

Now mark the difference between the behavior of these particles, and in doing so bear in mind that they are dominated by their respective charges of electricity. The positively charged anode particle relatively has slight radiating force which is principally owing to the concentrativeness of positive electricity. In clotting of blood, and in its effects on the tissues, in general, the positive electric current exhibits its concentrating qualities. Rays from the anode may have a speed of 10,000 to 20,000 miles per second. They are stopped by a sheet of paper. In a strong electric field they are deflected towards the negative pole. Their energy depends on the elasticity of the induction field of the electric charge, which has the property of impenetrability to like fields—the magnetic law of likes repelling; and also upon the positive charge seeking a point of neutralization. When the cathode rays are obstructed by placing a lamella of glass in their path, neutralization of the electric currents takes place in the lamella, and anode rays will pass from the anode to the lamella—a stream of negative matter positively charged.

The cathode rays, the negatively electrified cathode particles, constitute a stream of luminous matter issuing on straight lines perpendicularly to the surface of the cathode, and independently of the position of the anode, which may enter at any part of the tube without affecting the direction of the radiant stream. The bombarded spot of an opposing surface manifests a singular illumination. The cathode rays have mechanical properties, and are deflected by a magnet. They are capable of charging a body with negative electricity. They produce fluorescence, affect the photographic plate, and

possess a degree of penetration of opaque bodies depending on the potential of the current, the rarity of residuum, and the character of the medium. The cathode rays heat the bombarded object. Their properties do not depend on the character of the residual gas. Ultimately the electric charges on the anode and cathode particles must meet and mutually neutralize.

The Roentgen Rays have their origin at the bombarded spot. The characteristics of these rays are as follows: They affect the photographic plate; produce fluorescence of certain salts; and pass through substances entirely opaque to ordinary light, as paper, wood, hard rubber, etc. They have distinctive relative power in penetrating flesh and bones. They are not electrically charged, but discharge bodies already charged by rendering the air an electric convector. They are not reflected by metallic surfaces, but are irregularly diffused, and are changed in character thereby, becoming more like ordinary light, and with diminished penetrating power. This latter fact portrays the resemblance between Roentgen rays and ultra violet radiations.

Roentgen rays of great intensity become visible. As the pressure of the tube is lessened to a definite minimum, and the potential of the current proportionally increased, the Roentgen rays are more penetrating. With a maximum decrement consistent with electric convection, and under the greatest electric potential, the rays will pass through metals, shells, etc. In reference to these radiations deductions from the hypotheses lead to the following conclusions:

1. Anode particles are indefinite aggregations of negative matter with a limited binding of positive matter, and the superinduced gravitational lines of force of the earth and sun; externally they are herded by the induction fields of cathode particles.

2. Electrically anode particles become charged positively and their radiant energy is attained by virtue of the impenetrability of induction fields to like fields according to the magnetic law of likes repelling; and also by virtue of the fundamental neutralization law.

3. The speed of anode rays is retarded by the concentrativeness of the positive charge; and the penetrating power is hampered by the size of the particle.

4. When under minimum pressure cathode particles are the ultimates of the analyses of ponderable matter. Under the relation of all matter to all space they are indivisible, and their intrinsic binding force is the concentrativeness of positive units. However, a cathode particle may possess a varied constitution dependent on the degree of exhaustion of the tube. It may be one of the many chemical elements in equilibrium between the minimum and maximum pressure consistent with electric convection.

5. Cathode rays are cathode particles charged negatively. Their radiant energy is principally the mutual repulsion or diffusibility of negative (electric) units; and their penetrating power depends on the minuteness of the particles and the energy of their charges. They are independent of the position of the anode by virtue of their intrinsic diffusibility. They have been termed "Electrons," which is a misnomer. The bombarded spot is heated by the chemical action of the particles.

6. The Roentgen rays have as their element a corpuscle of ether, the extreme product of corpusculation in ultra violet radiations. The particle of the cathode rays partakes of the form of a comet, the tail leading and the head following as a cometary body leaves the sun. The cathode particle loses this form of polarity at the bombarded spot. The head or positive part depolar-

izes and emits a corpuscle of ether of minimum ultra violet dimensions which becomes the element of Roentgen rays.

It is conceivable that the particle of the cathode rays admits of degrees of polarization owing to degrees of electrification, and that the head will then give off a larger corpuscle, which will be visible. The photographic plate is affected by Roentgen rays permeating the induction fields of sensitive salts, which dissolve so as to accommodate the additional ether. This is a demonstration of the diffusibility of matter. Roentgen rays render the air a conductor of electricity by the molecules of the air dissolving into convection particles.

VIBRATORY MOTION—RADIUM.

It has been conceived that within a molecule atoms are in constant to and fro, or circulatory motion. Again it has been conceived that molecules are in constant motion as in the kinetic theory of gases. An incalculable number of such theories have obtained credence. They are absolutely foundationless. The gravitational influences of the earth and sun prohibit such vibrations. Within the sphere of positive matter the constituents of a molecule, or those of a mass are relatively at rest, and only disturbed by extrinsic force. This rule has no exceptions as regards vibratory motion.

When a piece of soft iron is placed within a field of an interrupted electric current it is magnetized and demagnetized with a frequency which may be only limited by that of the current interruptions. The polarization and depolarization of the iron typifies the processes of conductivity of nerves, of contractability of muscles, of the transmissibility of force by ether, and those of magnetism, crystallization, and polarization of molecules

and masses in general. The only other primary motion of the constituents of molecules or masses is that of the wave form occurring in the transmission of sound and light, which is alternate condensation and rarification in the medium.

Under favorable conditions when a molecule polarizes it assumes symmetrical hemispheres and equipotential polarities. Hence in crystallization some substances require the presence of an additional element such as the "water of crystallization," or "alcohol of crystallization"; and hence muscularization requires the presence of a salt. These additional elements of polarization are emitted on depolarization.

Radium has a molecule of distinctive equilibrium which, under pressure, permits its polarization in the presence of specific associating elements. It polarizes and depolarizes with extreme rapidity, and when polarizing it symmetrizes its hemispheres by absorbing two elements similar to, or identical with, the anode and cathode particles. During polarization in order to render its poles equipotential the molecule of radium splits up ether molecules into electrical units, which charge its poles—the pole constituted by the cathode particle is negatively charged, and the pole constituted by the anode particle is positively charged. The positively charged anode particles are emitted during depolarization of the radium molecules as alpha rays; and the negatively charged cathode particles as beta rays.

It has been shown that the temperature surrounding a piece of radium is three degrees higher than that of the air at a distance. Radium at moderately high or low temperature does not modify its radioactivity, but when placed in a vacuum it loses the property.

It has been stated that it requires about 1600 years for radium to lose one half of its energy. The author

is convinced that this calculation is made on a wrong basis, and that radium loses nothing by its radioactive processes. It does not even undergo wear and tear such as ensues when a machine is driven by hydrostatic pressure. Thus alpha and beta rays are accounted for by their emission from radium when its molecule depolarizes. The production of gamma rays, light, and heat, together with the source of anode and cathode particles, are still to be explained.

We will consider surrounding conditions. Radium is under atmospheric pressure which is given as about 15 pounds to the square inch. Oxygen, nitrogen, or any other element is pressing on the surface of the radium molecule. We will select oxygen as the source of the associating elements of polarization. Its molecule is comet shaped—head downwards, tail upwards. Hence, when polarizing the radium molecule chips and absorbs a cathode particle from the positive head of the oxygen molecule; and this is followed by absorbing part of the tail in order to symmetrize its hemispheres. Simultaneously the differential polarities dissociate an ether molecule and the poles become electrically charged.

We have here to consider the induction fields of the molecules of oxygen and radium. The radium molecule in equilibrium, and having a positive free force, is surrounded by an induction field of ether; and the oxygen molecule, comet shaped, having polar free forces, has therefore induction fields of ether. The ether in these fields is disposed of as follows: The ether within the field of the radium molecule is split up into the polar electric charges; the ether of the field surrounding the tail of the oxygen molecule is set free as heat and light; and the ether of the molecular head radiates as an ultra violet corpuscle.

A molecule in a distant star depolarizes and sets free an ether corpusele, which also depolarizes, and this corpuscular impulse is propagated for an inconceivable distance towards our solar system. The inconceivably minute initiative impulse travels this inconceivable distance because it meets no resistance in the medium. It is the same with the inconceivably minute energy of the radium molecule which has initiated an unequilibrium of the various radiant elements. But even this initiative is accomplished with the aid of atmospheric pressure. Thus the gamma rays are simply incidental to the production of alpha and beta rays, and like the light from the stars they move in a medium giving little or no resistance. Their penetrating power ensues from their minute ultra violet quality. The heat seeks equilibrium in the atmosphere. The reactions as a whole are analytic, and hence have unequilibrated products which with the exception of the gamma rays are acted upon by atmospheric pressure. *Atmospheric pressure is the main source of energy of alpha and beta rays.*

Here it is pertinent to state that there are two forms of polarization: (1) The magnetic form in which each molecule of the substance is polarized; (2) the electrolytic form in which positive matter accumulates at one pole and negative matter at the other. A comet is the most pronounced type of the latter form, but the sun and the planets assume this form. The directing influence in the comet's case is the gravitational and electric forces of the sun.

Like all other substances radium disintegrates by chemical or other means, but its radioactive processes do not necessitate any such change in its own constitution. As a result of radioactivity helium, which is inert, and an emanation which is radioactive, are produced. The latter has all the properties of radium, admits of

greater concentration, and is more available for therapeutical purposes, under certain conditions.

It is convincing that the loss of one particle of the emanations, without compensating association, would be destructive to the vibratory balance of the radium molecule, and consequently to its efficiency in radioactivity. Hence it is apparent that some source of supply must be at hand from which the radioactive substance compensates its loss, thus preserving its mass and its intensity of action.

We have selected oxygen as that source. If the anode particle is of the same order as an atom of helium then one-fourth of an oxygen atom should be apportioned for its formation. The mass of a cathode particle, which is similar to the element of beta rays, is calculated to be $1/1700$ of the hydrogen atom. This includes its electric charge which we concluded to be one-fourth of its constituent value. We will say that about $1/1200$ of the atom of oxygen forms this particle. This will leave approximately $11/16$ of the oxygen atom which may be assigned to the formation of the emanation. The emanation of radium is now recognized as a chemical element having an atomic weight of 220, and it is conceivable that 20 atoms of oxygen will each contribute $11/16$ of its mass to form an atom of the emanation. On this basis it may be predicted that the elements of beta rays are twenty times more numerous than the emanations.

So far no one has been able to detect any loss in the weight of radium, or any decrease in its activity. Yet physicists have concluded that it loses weight and decreases in activity, otherwise, as it appears to them, the principle of conservation of energy would be infringed upon. The amount of heat evolved by the activity of radium has been measured by Curie with exactness. On

the supposition that this heat energy is evolved by the disintegration of radium it is estimated that one gram will furnish two thousand million calories, or three thousand times the amount of heat evolved by the combustion of one gram of coal. The question has been put: Can man gain control of this marvelous accumulation of "subatomic energy"? The answer is that the first step towards controlling the energy is to comprehend the conditions of its production. That the energy is atomic or subatomic is certainly incomprehensible.

When a substance is subjected to heat it may undergo molecular dissociation, but heat in this case is absorbed; or if pressure is decreased dissociation may take place but in this case also ether (heat) is absorbed, in both instances by increase of molecular fields. Again if radium is disintegrating during radio activity reduced pressure would favor the process, which it does not. On the other hand when a molecule of oxygen is broken up by the polarization of the radium molecule the latter remains unaltered, the components of the oxygen molecule furnishing the energy under atmospheric pressure, their potential energy being changed to an active one. Thus the oxygen molecules, comet shaped, have positive and negative polar fields of ether, and the results of disintegration are electrically charged alpha and beta particles, and neutral particles of helium and the emanation. Thus, these particles having little or no intermolecular ether, the ether in the two oxygen fields radiates as heat, light, and gamma rays. What the radium molecule really does is to break up the oxygen molecule into radiating particles, and ether molecules into electric charges. Atmospheric pressure does the rest.

Uranium X and Thorium X—Equilibrium: Crookes and Becquerel by chemical processes separated an unknown substance which they named Ur X. This sub-

stance gave out beta rays but no alpha rays. Conversely uranium had lost the property of emitting beta rays but retained that of emitting alpha rays. Gradually Ur X lost its radiating property and uranium regained fully its property.

From the molecule of ether to the solar system all matter is under an equilibrium or seeking an equilibrium (see page 97), the causal factors of equilibrium being pressure, temperature, modified by surrounding elements. As regards the elements of construction the author in a former work advanced the conception that the higher atmosphere was similar to a partial vacuum tube where cathode particles were produced. Owing to their minuteness and positive character these filter downward in the molecular interspaces, and the lower atmosphere is thus saturated with these particles. Therefore in the atmosphere all the required elements are present for building up a molecule to its full equilibrium. The particles will have a specific pressure apart from that of the atmosphere.

Uranium X splits up a molecule of oxygen on polarizing and absorbs anode and cathode particles, and on depolarizing it radiates cathode particles but retains anode particles until it is built up to a state of inactive equilibrium. The converse of this occurs as regards uranium, which radiates anode particles but retains cathode particles until reaching an active equilibrium.

AURORAE POLARES.

The rays of an aurora polaris cross the magnetic meridian at right angles, are parallel to the dipping needle, commonly move westward, and frequently have a strong tremulous motion. It seems that the causal forces of aurorae sometimes takes on the form of thunder storms.

It has been conjectured by Mr. Canton, that aurorae are electrical discharges.

The light of the auroral spectrum usually consists of a single line in the greenish yellow which does not coincide with the spectral line of any known substance. Aurorae reach maxima every ten or eleven years, a period coinciding with that of the maxima of sun spots.

In the month of May, 1921, aurorae were observed in California of the most brilliant character. Streamers reached from the northern horizon to beyond the zenith, and displayed all the colors of the rainbow. Near the zenith a canopy of light was displayed which scattered and appeared as luminous clouds. Wireless telegraphy along the coast was notably disturbed.

In Chapter V we have explained the processes of mountain building, volcanic eruptions, and earthquakes, on the basis of back electric currents from the terrestrial poles neutralizing within the unstratified portion of the earth. It will be observed that we follow (Figs. 17 and 19) the aurora polaris under normal conditions to the poles of the sun; and that the initiatory interruption of the solar terrestrial thermo-electric cycle occurs in the sun, eventuating in sun spots, and concurrently in the sequelae of back electric currents as manifested on the earth. Mark the important fact of the relation of sun spots to the terrestrial phenomena being a coincidence of results from a common cause.

We will define aurorae in abnormal positions as manifestations of convection electric currents from the normal aurorae polares seeking neutralization through the atmosphere, the pathway of least resistance under attendant conditions. The manifestations of an abnormal aurora are derived in a great measure from the neutralization of north and south polar aurorae; and such neutralization explain thunder storms and like phenomena.

CHAPTER XVIII.

White Light.

The analysis of white light by the spectroscope shows that it may be decomposed into all the colors, and an indefinite number of shades whereby each color gradually emerges into the adjoining ones. In addition the spectrum extends through the fields of the ultra red and ultra violet radiations. The constituents of white light on emerging from the glass prism of the spectroscope are bent towards the thick end of the prism, and from red to violet they are increasingly bent.

The explanation of the facts relative to white light is clear. The induction fields of ponderable molecules are differentially dimensioned, and the ether set free from these fields differ in quantity from the minute ultra violet to the relatively larger ultra red corpuscle. A molecule of a metal at a white heat is radiating a corpuscle whose components embrace all the colors.

Glass is a compound of silica with one or more basic substances fused at a very high temperature. The high temperature means that ether in relatively large quantities is polarized in the molecular fields, and this is the essential factor in transparency. The molecular fields of glass are capable of transmitting a corpuscle of ether equal in value to all the color corpuscles of the rainbow, and when fusing at a white heat it emits such corpuscles. These facts indicate that white light is a distinct color whose corpuscular value is that of the ultra red class, and it is clearly conceivable that a special cell is provided in the eye to distinguish and absorb it.

In a uniformly depolarized ether field the white light corpuscle is transmitted in the same manner as the

other colors, but on passing through polarized fields as those of a glass prismatically shaped the results differ. The other color corpuscles pass through a limited area particular to each, and though bent they maintain their corpuscular integrity; on the other hand the white light corpuscle covers the whole molecular induction field of the glass, and on leaving the field its integral parts form an indefinite number of corpuscles. If we study the lines of the polarized field of a magnet (Fig. 22) it will be quite apparent why corpuscles of light are bent in different degrees.

The polarized lines radiate outwards from the surface of the molecule (Fig. 30), and they diffuse as they pass outward. Hence a line drawn through ether of uniform density will be at right angles to the polarized lines, and will have a greater curve the more distant it is from the molecular surface (see pages 209, 210). The degree of resistance to radiation and the degree of the density of the medium depend on the intensity of the polarization. Thus it may be postulated: *That each white light component, of corpuscular equivalency, will follow a pathway, through a polarized field of ether, of a breadth equal to the length of its wave front, and presenting a resistance equal to, or less than, its energy content.*

Glass is composed of polarized molecules in parallel lines running from pole to pole. At the terminal poles the molecular polar fields have increased area, and the density lines have greater curves. Now the lines being diagonally cut, it follows that they terminate along the two prismatic sides. It is evident that this fact accounts for the rays being bent on leaving the prismatically shaped glass.

It is clear that corpuscular radiations selectively penetrate resisting media; and in all cases of differentiated

penetrability it is the adaptability of the corpusele to the pathway as regards content of material and energy which is the enabling factor. The material of the corpusele must supplant the displaced material of the field, and the energy of the corpusele must overcome the resistance of the field.

REFLECTION OF LIGHT.

Under great pressure the polarized lines of force may in whole or in part surround the mass instead of being intermolecular, and in this case the light radiations, following the induction fields of the mass, are reflected.

THE DOPPLER PRINCIPLE.

If the source of light, such as a star, be stationary the specific character of its radiations will be shown in its spectrum. If the same source be travelling away from the observer the light lines in the spectrum will move toward the red end. On the other hand, if the source be travelling towards the observer the light lines will move towards the violet end.

On studying the induction field of a polarizing molecule it will be apparent that it enlarges, when surrounding ponderable pressure is reduced, and hence on depolarization a larger corpusele of ether will be set free. Now this is the case of the hindermost part of a moving body as its atmosphere does not acquire the momentum of the solid body and thus tends to lag behind. On the other hand if the surrounding pressure is increased a smaller corpusele will be emitted, and this is the case at the front of the moving body. The principle of Doppler is thus fully explained and upheld.

Doppler's principle shows that density of surrounding ponderable matter is a factor in producing and differen-

tiating color corpuscles. But clearly the density, or degree of polarization of the ether, does not depend on the ponderable pressure but on the quantity of the free force of the ponderable molecule, only the quantitative value of the corpuscle depends on the degree of ponderable pressure.

ABSORPTION OF LIGHT BY GASES.

A layer of gas or vapor between the source of white light and a spectroscope absorbs the colors which it emits if incandescent. The remaining part of the white light then appears as a bright line spectrum.

The property of a gas absorbing its own color of emission approaches the function of the optic nerve in differentiating colors. The molecules of the intervening gas are not polarized and their fields possess enough of ether to satisfy one polarity when vibrating in incandescence. When white light is passing through the gas it absorbs enough of ether to satisfy the remaining polarity, and this it emits when incandescent. The portion of the gas approximating the source of white light evidently emits as well as absorbs its particular color.

LIGHT AND ITS SOURCE.

Is the velocity of light independent of that of its source? Light does not receive an impulse from mass movement but from depolarization of the molecules of the mass, or of the ether within their fields. Light corpuscles are entirely imponderable and incapable of acquiring a momentum. Light neither gains nor spends force in an open field of ether. If it were possible for

the source to move towards us faster than light there would be no light, as the light corpuscles would be absorbed as heat by the moving body, or it would be left behind and arrive later. We might then see the distant surface of the body as its light radiates through the ether rushing in behind it. If the source be moving from us, the rays, being free from gravitation, will be independent of its source immediately on emission, but altered according to the Doppler principle.

These conclusions apply to a source surrounded by a field of free or depolarized ether. If, however, the source of light is a sun, or other body of high potential, surrounded by an intensely polarized field of ether, some part of the medium may be carried along with the source. In the case of such a source moving from us with the velocity of light, the light would still have relative motion as regards its source, but no absolute motion or relative motion as regards space, until it reached the bounds of the moving medium. In the case of a source moving towards us the light would double its absolute motion and would maintain its usual motion relative to its source until it reached the bounds of the moving medium.

The postulate stands thus: The velocity of light is independent of the velocity of its source as regards both absolute and relative motion; and its velocity is independent of the velocity of the medium as regards relative motion, but is dependent as regards absolute motion.

VELOCITY OF RADIATIONS.

The color elements of light have the same speed. They decrease in caloric value or material quantity, and in energy content or condensative potency, from the red to the violet. Velocity in a non-ponderable or non-resisting

medium is not proportional to the energy content of the corpuscle, because there is no energy spent in passing through an equilibrated field of ether. The laws of ponderable matter do not apply to an imponderable medium. The heat energy of a corpuscle is proportional to its material quantity, but clearly ether in relation to thermic activity is mainly a passive agent, the active agency being the diffusive property of ponderable matter. Ether as a factor in heat manifestations is unequilibrated in relation to ponderable matter, but may, or may not be, equilibrated in relation to space.

The dissolving qualities of ponderable matter in the presence of heat is identical with its dissolving qualities in partial vacua. The ether in a vacuum (a space excluding ponderable matter) is in equilibrium as regards space, and in partial vacua becomes equilibrated in relation to ponderable matter when the latter equilibrates.

In an equilibrated field of ether heat must radiate as waves, and must have the same speed as light, but the waves are not corpusculated. They cannot assume the transverse character of water waves as ether has no surface, and are therefore perpendicular to the line of propagation as in sound waves.

LIMITATIONS OF ETHER AS A MEDIUM.

Ether is the great medium of transmission of force between ponderable bodies, whether it be in the nature of attraction, repulsion, or neutralization; or whether it be as light or heat radiation. Even in the transmission of sound the presence of ether is essential to the elasticity of the ponderable medium. It is a carrier of force by virtue of its polarizing, condensative and elastic properties. But these properties have limitations.

A magnet may be polarized to a maximum degree and so it is with ether. The intrinsic force of an atom of ether cannot be externally directed to an extent more than one half of its value. This is the limitation of the molecule as a carrier. We will apply this conception to the sun's forces. It is possible that the solar gravitational or positive forces are beyond the capacity of surrounding ether to fully transmit them. These forces must be neutralized either externally through the ether, or within the solar body. At the solar south pole negative matter accumulates which must neutralize positive force. Now this negative matter is center fleeing, owing to the squeeze of positive lines of force, but if there is a surplus of gravitational force beyond the capacity of ether as a carrier the negative matter of the south pole would be held fast by the neutralizing capacity of such surplus, and this explains the presence of a negative polarity of the solar electrolyte.

The conception of a limited capacity as to transmission of force does not apply to heat which depends on the unequilibration of ether. The extent of the sun's spots denotes the possible extent of this unequilibrium. On the other hand ether has a limit to its corpusculation, which applies to light.

CORPUSCULAR LIMITATIONS.

Corpusculation of ether has limitations. The infra violet corpuscle cannot be less than two molecules of ether. Theoretically this is the limit placed upon it by the ether itself. A limitation is also placed upon it by the limit of the polar potential of its principal, the ponderable molecule.

In considering the limitation of ultra red corpusculation several factors of importance obtain: The relation of all matter to all space furnishing a minimum pressure which tends to maintain corpuscular integrity; the fundamental law that positive and negative matter seek neutralization at minimum distance and by maximum contact, and the law of repulsion between negative units, which tend to produce dispersion. Thus there is a limitation to the size of corpuscles determined by an equilibrium of the related forces. These factors of limitation have also a bearing on the dispersion of white light by the spectroscope. Also it may be inferred that the size of each molecule and each independent body in the universe is determined by related forces. The corpuscular masses of ether could not attain to the size of marbles. Moreover as with the infra violet the supra red corpuscle cannot excel the limitations of the polar potentials of ponderable molecules.

CHAPTER XIX.

"Electrons." Electric Conduction.

The definition of the term "electrons" has been given as "atoms of negative electricity." Atoms of ponderable matter are supposed to be made of electrons "which may pass from atom to atom, and are sometimes entirely separated from atoms." "Very little is known as to the structure of atoms, but the electrons in the atoms undoubtedly move about or vibrate very considerably, possibly somewhat as planets move about the sun, while the atoms move about inside the molecule, and molecules move inside the mass of matter." "It is also possible under various conditions to have electrons existing more or less independent of atoms as 'free' electrons or negative electric charges." "In the discussion of views as to the nature of electric charges we have seen that the most probable hypothesis is that they consist of electrons, or units of electricity, which can be transferred from one body to another, an excess above the normal constituting the negative charge, and a deficiency a positive charge." ". . . electric current consists of a stream of electrons each of which is performing more or less random motions." "The explanation is to be found in the frequent collisions between electrons and atoms." Again, "Those atoms of electricity we now call electrons." "According to the electron theory of matter one or more electrons are revolving about every atom. If the number of electrons revolving clockwise is equal to the number revolving anti-clockwise then the atom is non-magnetic."

The above quotations are from "a text book of Physics" having five eminent university teachers as contributors. The least that can be said of these quotations

is that they were dictated by "random motions" without the guiding hand of a fundamental hypothesis. With the exception of electricity consisting of units, deductions from the hypotheses disagree with every concept expressed. We have stated that the term "electron" is a misnomer. The term has been applied to the element of the cathode rays which in extreme diffusibility is the ultimate ponderable particle electrified negatively, whose mass has been estimated as $1/1800$ of the hydrogen atom, but three-fourths of which is ponderable matter and only one-fourth electricity. Again, electricity never exists, and cannot exist, independently of ponderable matter, because of its high potentiality. A ponderable particle, however intense its force, when assuming the molecular form, as the cathode particle in extreme diffusibility, surrounds itself with ether which is polarized, and thus local neutralization of the free force of the molecule occurs. (Fig. 2). If an electric charge attach itself to the particle then the free force consists of electric charge, and polarization of the surrounding ether takes place accordingly. (Fig. 31). There is always moving ponderable matter in electric convection currents (Fig. 8). In electric conduction the electric units are attached to stable ponderable molecules. A space filled with ether affords no electric conductivity.

We have stated that the ultimate ponderable unit possesses an equivalency of two electric positive units and one negative, the ponderable equivalents being identical with electric units. But the author is convinced that ponderable and electric matter are never mutually transformed, finding no evidence of such transformation. Ether and electric matter have chemical relations, but ether and electric matter have only physical relations to ponderable matter, in as much as they never become

constituents of ponderable molecules. The quantity of ether as related to the quantity of ponderable matter is determined by the relation of all matter and all force to all space, and these relations are unchangeable. The only difference between electric units and their ponderable equivalents in the constitution of the cathode particle is the absolute freedom from dissociation of the latter by the forces of nature. A free molecular force is exactly the same as an electric force the only difference being in regard to stability.

Electric conductivity is explained as follows: Generally it is the negative unit which travels; but electrodes placed on the human body demonstrate by differential effects that both units travel until great resistance is met with, which the negative current is more capable of overcoming. The author in a former work described the trapeziform method whereby each ponderable molecule becomes charged, and by performing a swinging motion delivers its charge to the next in line, and rebounding, takes on a second charge. With each movement there is a vibration—polarization and depolarization—in the conducting molecule. This is evidently the mode of electric conduction in metals as evidenced by the oscillations in inductive fields.

DIFFUSION OF METALS, LIQUIDS, GASES.

Metals such as potassium, sodium, lithium, zinc, and others of pronounced positive constitution react with ultra violet light. The metal becomes positively charged when the light is incident thereto. The explanation of this is that the unequilibrated ether of the light passes between the molecules of the metal thus affording an opportunity for the diffusive properties of matter to

become effective. The molecule being positive in construction allows a cathode particle to separate. The escaping particle being relatively more positive than the remaining portion, a differential potential has been created, the ether of the light is split up, and the cathode particle is negatively charged and the remaining portion positively charged.

If the metal is negatively charged originally it will lose its charge. In this case the cathode particle separates, and being the more positive element carries the negative charge with it. If the metal is positively charged originally its concentrating effect may prevent any reaction, or if separation of a cathode particle takes place, it flies off uncharged.

From a work on physics edited by A. Wilmer Duff I quote the following: "These photo electric effects as they are called have been shown to be due to the liberation of negative corpuscles, or electrons, from the metal by the action of ultra violet light."

Our deductions in this case are positive in character: A metallic molecule being distinctly dominated by positive force can not emit a negative corpuscle, "electron" or any negative constituent whatever, except on being absolutely dissociated, its negative constituents being in a minority are effectively bound by its positive forces.

Boyle's law: "The volume of a gas at constant temperature varies inversely as its pressure." This law is fully explained on the basis of the fundamental principles of diffusability.

The Kinetic theory of gases: "A gas consists of particles in continuous motion." This theory is incompatible with the law of gravitation which fixes molecules in relative stability. No cause of the vibratory motion has been assigned, and it is contrary to the law of relativity and equivalence as formulated in this work. The theory

violates the principle of the conservation of energy. In an homogeneous element motion of the particles would have to overcome the impenetrability of like fields.

The forces of diffusibility are: Repulsion between negatives; the neutralization strain; and the secondary principle of impenetrability of like fields. Matter, under its fundamental properties, is diffusive except when its minority force of concentration is supported by pressure. Under pressure gases or fluids mix, because space is economized by the molecules of one adjusting themselves to the interspaces of the other. (See the description of molecules, page 201). We will postulate thus: *No motion obtains in a molecule, atom, or subatom, but what has a demonstrable analogy in a mass.*

ELECTRO MAGNETIC THEORY OF LIGHT.

It has been shown by experiment that electric conduction is oscillatory. A spark consists of a number of flashes which has a frequency of 1/10,000,000 of a second. It has also been shown that there is a sympathetic response to a primary conduction in an induction field, if the molecules of conduction and the molecules of induction, such as in two identical wires placed parallel and of the same length, be exactly identical as regards vibratory frequency and resistance. If one wire is longer than the other the resistance varies and hence the frequency is influenced.

It has been shown by Heinrich Hertz that the electric waves emanating from the primary conductor, and radiating through the induction field, have the same velocity as light. Clerk Maxwell showed that it ought to be possible to create ether waves by means of electrical disturbances, and the Hertz experiment confirms the con-

ception of Maxwell. Hertz waves have the properties of light waves in as much as they are reflected, refracted, and polarized. But all of this does not warrant the conclusion of modern physics that light is an electro magnetic phenomenon, or that light waves are generated by oscillations of electrons.

We have stated in other works that electric conduction consists of an alternate charge and discharge successively of the molecules along the conductor, that each molecule has a trapeziform swing whereby its selective pole takes on an electric charge, and at the other terminal of the swing it delivers the charge to the adjoining molecule. This is accompanied by a polarization and depolarization as differentiated in Fig. 30, only, one of the molecular poles is electrically charged in place of it being neutralized through an ether field. In the electric spark and in the induction field of an electric conductor molecular polarization and depolarization are the components of a vibration which causes the oscillation of the Hertz waves. These are distinct from light waves in as much as they are not corpusculated. When emanating from an electric spark they partake of the nature of heat waves; and when emanating from an electric conductor they are simply polarizations and depolarizations induced in the surrounding field. However, in some cases ether, as heat, and as light, may be set free from molecular fields, on the molecules being polarized, either directly or inductively by an electric charge.

Light and Hertz waves have a common source of vibration—polarization and depolarization of ponderable molecules—otherwise they are distinct. Hertz waves are inductive, and they neutralize, and are equivalent to, the potentials and motions involved in electric conduction. The difference between the frequencies of

light and Hertz waves is owing to the greater freedom of molecules when incandescent, than in a conducting solid.

Ether waves as heat may be simply ether unequibrated. Ether waves as light are ether corpusculated, with a frequency depending on the period of polarization and depolarization of the primary ponderable molecules. Hertz waves from a spark are heat waves caused by neutralization of electric currents, with a frequency depending on the period of polarization and depolarization of electric conduction. Hertz waves in the neighborhood of an electric conductor are waves of induction, with frequencies the same as in a spark.

POLARIZATION OF LIGHT — DIMENSIONAL ORIENTATION OF ITS CORPUSCLE.

A corpuscle of light is undoubtedly propagated independently of adjoining corpuscles. Corpuscles may, however, be components of a wave front, in a ray, without loss of integrity. When propagated through an equilibrated field of ether corpuscles must assume a specific form. Each corpuscle must have a length and breadth of wave front. A corpuscle, however, is capable of modifying its shape. Its length and breadth may be differentially orientated. Such change of form evidently occurs when corpuscles are propagated through polarized fields of ether as in crystals of tourmaline. A corpuscle of light will successively pass through two such crystals if their axes are parallel; but it is obstructed by the second crystal, if their axes are crossed, on account of the dimensional orientation of the corpuscle. Light is said to be polarized when transmitted by polarized fields of the molecules of a tourmaline crystal, but its corpuscular dimensions are simply orientated.

The phenomenon of polarization has given rise to the conception of light being propagated by transverse waves. Such, however, is impossible in a medium having no surface, and in which cohesive properties are absent. The law governing selective transmission of the components of white light is relative to this matter.

MAGNETISM.

Deduction leads us to formulate the conception of magnetism, crystallization and polarization in general, as a pulling of all the constituent elements of one quality, of the molecules of the mass, towards one pole; and a pushing of all the elements, of the opposite quality, of the molecules, towards the opposite pole, the molecules still retaining their integrity. Thus each molecule has poles, and the mass also has poles, of positive and negative quality (Fig. 30). In the science of today the earth is considered as a magnet. This is a mistake as the terrestrial body is an electrolyte and as a whole is not a magnet, (Figs. 7 and 11). However, by virtue of crystalline rocks it may exercise magnetic properties. The magnetic law stands thus: Unlike poles mutually attract, like poles mutually repel. The attraction between unlike poles is based on the fundamental law of the strain to neutralize. Repulsion is based on the secondary property of impenetrability of like induction fields. In addition the fundamental property of attraction between positive forces—weight—acts against impenetrability of fields; and the fundamental property of repulsion between negative forces assist the secondary property of impenetrability.

CHAPTER XX.

GRAVITATION AND LIGHT.

Newton is credited with the conception that gravitation is instantaneous in its action throughout all space; and Einstein with the idea that no action can exceed the velocity of light.

Gravitation has a single action on the ether, that of polarization. Light is propagated by double action—condensation and elastic rebound. Hence the conclusion that gravitation has twice the velocity of light. That is to say, if we suppose that gravitation was absolutely annihilated between the sun and earth, and then reinstated it would take four minutes for the solar force to reach the earth. But after reinstatement the force would be continuous as in the case of polarization of a magnet. If gravitation was cut loose at the surface of the sun it would still act for four minutes on the earth, whereas solar light, if obscured at the sun's surface, would shine on the earth for eight minutes. The conception of Newton that gravitation acts throughout all space is inadmissible. Gravitation is neutralized within solar systems, and force can not act beyond the bounds of neutralization.

ABSOLUTE AND RELATIVE MOTION.

Observations by astronomers indicate that all ponderable matter is in motion. By deduction from the hypotheses it is established that motion is both absolute and relative. The only spacially stable matter in the universe is the interstellar ether. Under the supreme diffusible properties of matter it simply obeys the behests of the relation of matter to space. Marking a molecule

of ether would enable us to measure the absolute and relative movements of the stars. It is probable that the solar system never occupies the same space a second time in its eternal existence. This indicates absolute motion. On the other hand, every movement of the system in space must be reciprocally related to movements of other astral bodies. This indicates relative motion. Here, then, are relative and absolute movements combined. All cosmic units (solar systems) combine absolute movements, or movements relative to space, with movements relative to each other. Within a cosmic unit a body moving in the opposite direction to the system's motion may maintain, for a limited time, a constant relation to space.

All motions take place in accordance with the three primary laws governing the fundamental properties of matter, and are based upon an unequilibrium constituting the energy of the universe, which is definite and quantitatively unalterable. It follows that every motion has relativity and equivalency. Every motion is towards an equilibrium, but reaches it by causing an equivalency of unequilibrium, and is itself the result of a preceding motion seeking equilibrium. According to their fundamental properties and the three primary laws governing them, the units of matter of a solar system cannot be placed in any relative position or condition but what a definite unequilibrium of force exists.

Motion may be viewed as relative to equivalent motion; or it may be viewed as absolute, *id est*, relative to space. But there is an even more important and distinctive division which is as follows: 1. Motion as viewed from the standpoint of ponderable or complex matter. 2. Motion as viewed from the standpoint of imponderable or ether matter. Examples of relativity

of motion from the ponderable standpoint follow: A chemical reaction in which heat is absorbed is relative to reaction in which heat is emitted. Heat radiating from the sun is relative to electric convection currents passing to the solar body. The sun grows and the planets contract. Our sun radiates heat into space but this is balanced by heat received from the stars. A star courses through space but an equivalency of motion in others maintain the universal relation of stars to space. The relation of all matter to all space is constant, disturbance by a molecule, by a mass, or by a solar system having its relative equivalency. The two properties of matter, concentrability of positive, and diffusibility of negative, are each inherent and absolute in possession, but relative as regards the opportunity to display.

In the Great Cycle motion by virtue of the positive or concentrating quality of matter coördinates with motion by virtue of its negative or diffusing quality; and the maximum potential energy of a solar system, such as our own, sequential to these qualities, has an equivalency in the potential energy of extreme ionization in a nebula, caused by the action of the strain to neutralize by maximum contact at minimum distance in all matter. The motions of the universe are a play between the three fundamental properties of matter above named—a play that is eternal in cyclic form.

The relativity of motion is best observed in electric currents. We have here to deal with so-called primary and induced forces. Isolated static forces seek neutralization through a medium. That is to say that a force which is locally free or unneutralized must seek neutralization at a distance. The positive free force of the earth is partially neutralized by its negative atmosphere. The positive free force of the sun is partially neutralized by

the negative matter of the south pole. The free positive forces of the sun, as a whole, including those of the planets, must be neutralized within the system, hence the absolute necessity of a negative common atmosphere (Fig 6). It is the same with current forces, not only as regards neutralization of their potentials, but as regards their motions. Consequently there are currents of induction which not only neutralize the primary forces but neutralize their motions (Fig. 15, 16). Induction fields are simply pathways towards complete neutralization of primary forces.

Within the solar system relativity of motion is exemplified. The planets and solar photosphere rotate around their center of gravity in the same direction. The primary force of rotation must reside in the central portion of the solar body (Fig. 7). There are then electric motion and mass motion whose relativities are to be accounted for. The electric currents of the sun (page 87) have their relative equivalency in the electric currents of opposite direction in the planets; the motion of the positive matter of the system has a relative equivalency in the counter motion of negative matter, principally in the common atmosphere, but exemplified in the outer satellites of the major planets (Fig. 6).

Relativity and equivalency are of two classes: 1. Pertaining to simultaneous forces neutralizing through fields, as in the case of primary and induced electric potentials. 2. Pertaining to preceding and sequential forces as in the case of heat preceding and following electric currents.

We will consider motion from the standpoint of ether matter, as regards its relativities. Alpha Centauri is 25,000,000,000,000 miles, or 8 light years away. Light in absolute motion traverses space for this distance in this time. In the meantime astral bodies are undergoing

relative movement to the pathway of the beam of light from this star, but motion of the stars and the motion of the ray are mutually independent, and without any relative equivalency whatever. Moreover the propagation of the light is entirely independent of its source, or its motion. Its propagation in interstellar space is entirely independent of ponderable matter or its motion. However, the motions of star light are to and from solar systems, and here is relative equivalency from the standpoint of ether or imponderable matter, and by this the equilibrium of ether in space is maintained.

We have postulated that all motion is relative to an equivalency of counter motion. Let us apply this to the propagation of light without indulging in the weakness of creating a special theory for the purpose of explaining the relative facts. We will consider a corpuscle of light. It is preceded by a similar corpuscle, and succeeded by another, both of relative equivalency, and in this respect it is analogous in principle to cyclic energy; but it has no inductive or neutralizing simultaneous equivalency as the electric current has. This is owing to the fact that the corpuscle has no free force which requires inductive neutralization. It has potential energy in the form of compression and elasticity, by which it strikes a blow to the succeeding corpuscular quantity, and in doing so returns to normal, or subnormal. In corpuscular action there is motion and counter motion equivalency as regards the condensing and rarifying phases (page 208). Light radiates from Alpha Centauri to the solar system by the energy of the initiatory corpuscles.

So far we have considered the corpuscle of light as being propagated through a field of equilibrated ether. We will now consider it as passing through an intermolecular and polarized field. It does not in any way

produce motion in the ponderable molecules of the transparent substance, but is entirely transmitted by the ether. Light is propagated in relation to the transparent mass independently of the motion of the mass. If the propagation varies, or is blocked, it is because of the orientation of the ether fields, their degree of polarization (density), or their dimensions. It is clear that propagation through a polarized field just as exclusively pertains to the ether as propagation through interstellar ether, only, the medium itself is modified by the potentials of the ponderable molecules, and partakes of the motion of the ponderable mass.

ETHER EXPERIMENTS.

It is evident that for an experiment to prove a proposition that all the factors of the case be considered. Sir Oliver Lodge proved that a rapidly revolving wheel did not deflect a proximate ray of light. But a rotating wheel is not analogous to the rotating earth, in as much as the latter radiates lines of force which polarize surrounding ether. Michelson and Morley concluded from experiment that intermolecular ether is not stable as regards space, but partakes of the earth's motion—that ether does not drift through the pores of moving ponderable matter.

Ether is imponderable and non-cohesive, and hence the immense interstellar and inter-planetary ether fields have spacial stability, simply obeying the requirements of the relation of all matter and all force to all space. But ether is polarized by the forces of ponderable matter, and when polarized it acquires additional properties, and one of its acquired properties is cohesiveness, the acquired property varying in degree according to the

intensity of the force transmitted. Ether in interstellar space offers no resistance to bodies passing through it, and ether in intermolecular spaces, being imponderable, offers no resistance to its being moved with the mass, and on the other hand when so moving it does not add to the momentum of a body. When polarized and cohesive ether still remains imponderable. A moving mass with intense force will intensely polarize surrounding ether, and conceivably, if there is no resistance, may carry a certain portion of it along. When there is the slightest resistance the ether will remain absolutely stable. Between stable and moving fields of ether there must be some cohesion and hence some friction. But an ether friction does not produce heat as no ether as a result becomes unequilibrated.

A tube exhausted of its ponderable matter moving, with an indefinite velocity, will carry its ether content with it, as the ether has no potentiality to overcome the slightest resistance in piercing the surrounding material. Neither has the ether content any ponderability to give it absolute stability. Ether in ponderable vacua behaves the same as ether in intermolecular spaces.

CHEMICAL ACTION AND ETHER.

In an analytic reaction, such as $(\text{H}_2\text{O})_2 = \text{O}_2 + (\text{H}_2)_2$, the potentials or free forces of the molecules are increased, and ether as heat is absorbed by increase of induction fields. In a synthetic reaction, as in the reverse of the above formulae, neutralization occurs, the free forces are decreased, and ether as heat is eliminated. A synthetic reaction may occur without the radiation of ether, such as $\text{S}_2 + (\text{O}_2)_3 = (\text{SO}_3)_2$. In this reaction no neutralization takes place and hence no heat is evolved.

A carbon atom is supposed to be a neutral body, and it has the property of uniting with itself to a relatively great extent, also with hydrogen atoms in numerous proportions, as in $C_5 H_{12}$. Such a synthesis neither absorbs nor eliminates ether as heat. On page 102 et seq. chemical synthesis is more fully considered.

Molecules of gases in partial vacua progressively break up into smaller entities, which assume the molecular form, with increased free forces, increased induction fields, and increased polarization of ether, until the indivisible cathode particle is reached under a definite minimum pressure. Thus decrease of pressure and increase of temperature produce the same result.

Changes in the physical states of matter, with or without chemical action, produce changes in the ether. Gases being transformed towards the solid state eliminate ether from the molecular interspaces; and solids being transformed towards the gaseous state absorb ether. Sulphur and oxygen chemically uniting eliminate ether by oxygen changing its physical state with increased pressure on the intermolecular ether.

CHAPTER XXI.

Einstein.

In an article in the London Times, Dr. Einstein expresses himself thus: “. . . the new theory of gravitation diverges widely from that of Newton with respect to its basic principle. But in practical application the two agree so closely that it has been difficult to find cases in which the actual differences could be subjected to observation. As yet only the following have been suggested:

1. The distortion of oval orbits of planets round the sun (confirmed in the case of the planet Mercury).
2. The deviation of light rays in a gravitational field (confirmed by the English Solar Eclipse Expedition).
3. The shifting of spectral lines towards the red end of the spectrum in the case of light coming to us from stars of appreciable mass (not yet confirmed).”

THE FIRST TEST OF EINSTEIN'S THEORIES. ORBITAL CHANGES.

Slow changes are taking place in planetary orbits, amongst which are flattening of the oval form, and twisting around the sky of the longest diameter. The chief factors in causing these changes will be considered. The sun is enlarging and his gravitational forces are increasing, and sequentially the matter of the planets is getting more positive, the negative matter being eliminated by the squeeze of the solar gravitational lines of force. Hence when a planet is north of the solar equator attraction between the solar and planetary bodies is increased, and when south of the equatorial plane repul-

sion will be decreased (Fig. 14). It follows that changes are continuously occurring in planetary orbits.

As regards the majority of the planets, various extraneous forces may influence them in their orbits, but in the case of Mercury the changes may exclusively depend upon the reactions between the sun and the planetary body. Mercury is in the midst of an extremely intense field of solar force perhaps reaching the maximum of the carrying power of ether. In this case the gravitational forces of other planets will be excluded from the field. Mercury is an extremely positive body and his orbit must be distinctly contracting. Mercury is a dead planet relatively, and is waiting burial by falling into the sun. All the planets are aging by becoming more positive in their constitution; and this change is the chief cause of the modification of their orbits. The change applies particularly to Mercury. (See The Planet Mercury.)

Both Newton and Einstein overlooked the main cause of distortion of the oval form of planetary orbits. The first test of Einstein's theories is adverse to his position.

THE SECOND TEST OF EINSTEIN'S THEORIES.

THE REFRACTION OF LIGHT.

Ether is the medium of light in all the phases of its course, and ether is imponderable but polarizable. The law of refraction is given thus: A ray of light moving in an homogeneous medium and falling on the bounding surface of another homogeneous medium may be refracted. We must deal with the state of the ether in the two media. The ether is polarized in the molecular induction fields, but in different degrees and in different directions. Hence the bending of the ray.

Now this is exactly what takes place when the ray from a star behind the sun is seen by an observer. The star light passes from the homogeneous medium of ether in interstellar space to an intensely polarized field of ether surrounding the sun, and is bent by the latter. Heterogeneity of media is based on the differential polarization of ether fields as regards intensity and direction. The induction field in the case of the sun is that of a mass with immense radiating forces, and in the case of transparent substances the induction fields are those of molecular forces. It is true that solar gravitation is the primary force of polarization, but gravitation absolutely exercises no pull on the ray of light, which would be necessary as a proof of the correctness of Einstein's theories.

THE THIRD TEST OF EINSTEIN'S THEORIES.

MODIFICATION OF THE VELOCITY OF LIGHT.

As regards this test it is apparent that in principle it rests on the same basis as the second. Deductions from our hypotheses entirely reject the ponderability of light rays as its medium is imponderable under all conditions. Einstein postulates that gravitation exercises a pull on a light ray, and hence a ray emanating from a star will be retarded by the gravitational influence of the astral body; and that such retardation will increase the wave length and thus move the color towards the red end of the spectrum.

Now independently of the ponderability there is a question raised of retardation under the conditions named. Surrounding the sun, or other star, the medium is intensely polarized and its conductivity of light may be diminished. It is known that heat conductivity, in

iron when magnetized, is diminished when heat radiates in parallel direction with the magnetic lines of force, a condition similar to light passing from an intensely gravitational body. But color neither depends on retardation nor decrease of conductivity, but upon the quantity of ether, or the quantity of force, represented in the polarized field of the emitting molecule at the source of the light. The change of color, as in the Doppler principle, occurs at the molecular source.

There are two radiating forces from a star, occupying the medium ether in different ways: 1. Gravitational force which polarizes the ether. 2. Light which alternately compresses and rarifies the ether. Gravitation is the stronger force. Moreover it is constant, whereas light is intermittent in its positive phase of condensation.

When ether is polarized it may be fixed, thereby acquiring relative stability, and cohesiveness. Its density of material and intensity of force conforms to the intensity of the polarization, and thus it acquires selective transmissibility even as regards the same field, which diffuses in intensity outwards.

Another consideration presents: A color corpuscle at its origin has a specific quantity of ether matter engaged, and a specific quantity of energy. Throughout the course of a ray the energy of its color is changelessly maintained. Even the dissociated resultants of white light must have an aggregate of energy equal to the white light corpuscle. On the other hand an intensely polarized field may resist corpusculatation. Such a field on receiving a corpuscular blow on its proximate surface transmits the same to the distal surface by one continuous propagation, and without intervening corpusculatation. This is similar to a stick being struck at one end, and the other end transmitting the blow to surrounding media. The stick may receive a dent by

the initiatory blow, and a color corpuscle striking a polarized field may dent and enter the field selectively, and the blow will follow a line of the same density of material and force to the opposite surface, where again it will be propagated by corpusculation.

The conclusion is that light may be retarded by pre-occupied or intensely polarized media, but that no change in the color ensues, and no pull is exercised on the ray by gravitation however intense the latter may be. It is further concluded that on leaving the initiatory molecular sources a ray of light is independent of the forces of the mass, but may be modified by the state of the proximate medium.

SPECIAL AND GENERAL THEORIES.

Einstein exemplifies his ideas by introducing a railroad carriage in uniform motion and definite velocity in reference to the embankment, and a man, also with definite velocity, walking in the carriage in the same direction. What is the velocity of the man in reference to the embankment? Answer: The velocity w of the man in reference to the carriage added to the velocity v of the carriage in reference to the embankment equals the velocity W of the man in reference to the embankment. The result supports Einstein's conception of relatively. It is symbolized thus: $W=v+w$.

Einstein then considers the law of the propagation of light as regards the principle of relativity. Light is propagated in "empty space" with a velocity of 186,000 miles per second. He refers the process of propagation to a rigid reference body or coördinate system, the embankment. The supposition is that the air is removed, and that the light is then being propagated *in vacuo*. The railway carriage is again travelling along with a

known velocity in the same direction as the ray of light. The ray takes the place of the man in the previous example. What is the velocity of propagation of the ray in reference to the carriage? The answer is: That the velocity c of light relative to the embankment minus the velocity v of the carriage relative to the embankment equals the velocity w of light relative to the carriage. In other words the speed of light, 186,000 miles per second, is decreased relative to the carriage because of the motion of the latter, if the light is propagated *in vacuo*. Conversely and symbollically the answer is expressed thus: $w=c-v$.

The last result brings Einstein into an acknowledged dilemma, with the option of either abandoning his principle of relativity or the law of propagation of light in a so-called vacuum. Let us see if we can help him out.

We have postulated that owing to the diffusibility of matter a vacuum is an impossibility. Ether matter cannot be excluded from any space not occupied by complex matter. Within the sphere of such a body as the earth radiating lines of force cannot be excluded from any space. The terrestrial lines of force radiate beyond the moon's orbit. Hence within the so-called vacuum (say a ponderable vacuum) there is ether matter, permeated with gravitational lines of force, which polarize the ether, and bestow on it cohesive qualities. Moreover the ether within a ponderable vacuum is in equilibrium, and has no potential force which would enable it to radiate or pass beyond its local bounds, or to overcome the slightest resistance. Furthermore if a real vacuum were obtained light could not radiate through it. It follows that the carriage in the above example carries the ether along with it. Light and the man in relation to the carriage are exactly similar. Hence the velocity c of light relative to the embankment, plus the velocity v of

the carriage relative to the embankment, equals the velocity w of light relative to the carriage; or as symbolized, thus: $w=c+v$.

It is clear that there is no need of a special theory to sustain relativity of motion. Moreover special theories indicate weakness, and absence of fundamentality.

Some of the ideas of others, which Einstein quotes as lending support to his theories, are untenable, such as, that the binding force of the element of the cathode rays is its motion—"that the particles constituting the electron experience a contraction in the direction of motion, in consequence of that motion." The amount of the contraction has been expressed mathematically. Now the distance between the particles of the rays increase with diffusion, or distance travelled. Why does this not apply to the constituents of a cathode particle? We have here a special hypothesis untenable. Elsewhere we have explained the binding force of the cathode particle.

Einstein is reported as expressing his opinion that his general theory of relativity can only solve the problems of space and matter by regarding the universe as spatially finite, and closed. We find by deduction that matter under its aggregate properties is diffusive, and hence a spatially finite universe, bounded by outside emptiness, would have to be closed by a wall of indefusably adamant material of special creation.

As regards his general theory of relativity Einstein postulates that reference bodies or systems of coördinates should not be limited as regards their state of motion. He finds that the application of his general theory of relativity is in conflict with the idea that inertia and weight depend on the same constants—identity of inert and heavy masses. He considers a case of a system of coördinates in stable rotation relative to a system of inertia in the Newtonian sense. Einstein states that:

"The forces which, relatively to this system, are centrifugal, must, in the Newtonian sense, be attributed to inertia." He makes the sweeping statement that "these centrifugal forces are, like gravitation, proportional to the mass of the bodies." This is Einstein's second dilemma, and he considers a way out which classical mechanics and Euclidean geometry contradict.

Let us see how the matter stands as viewed from the standpoint of fundamental hypotheses. Weight and inertia are identical as they depend fundamentally on attraction between positive forces. The description of the case considered fits the relative conditions of the sun and earth, but here the main centrifugal force cannot be attributed to inertia, or attraction between positive forces, but to repulsion between negative forces. However, the centripetal and centrifugal forces in a planetary orbit must be effectively equal, otherwise the constancy of the orbital path would not be maintained. Hence it may be argued that the centripetal forces being equal to the weight, and hence to the inertia, it must follow that the centrifugal forces are equal to the inertia. Newton, Einstein, and others overlooked the fundamental principle of centrifugal action being repulsion between negatives.

We must bear in mind that at each orbital node the planetary body enters a field of force different from the preceding field of travel, and the forces of the new field begin to manifest either at perihelion or aphelion (Fig. 14). The forces of one field contract, and the forces of the other dilate the orbit. The earth as regards relative forces is in equilibrium in its orbit, or seeking equilibrium. It seeks equilibrium by orbital contraction and gains it at perihelion; and seeks equilibrium by orbital dilation and gains it at aphelion. It follows that independently of the equipotentiality of the forces of the

two spheres they must be equally effective, as dilation and contraction are equal. The sun, however, is a positive body and his lineal gravitational force between positives is greater than his lineal repulsive force between negatives. But as to the three fundamental laws gravitation is in the minority, and the earth is in equilibrium as regards the forces of the universe and as regards those of the solar system. Hence there are other factors related to the case (see *The Planet Mercury*). It must be considered that the crossings of the equatorial plane of the sun is accomplished by electric current forces, and that centripetal and centrifugal forces are strictly linear.

The centripetal, centrifugal, and circular movements take place within the induction field of the sun, and the primary forces must exist within the solar mass, which is the reference body to these movements. The situation demands a positive solar mass, with a positive and a negative electrolytic pole, and a central electric current of definite direction. Preceding and succeeding relativities and equivalencies alternately exist in centripetal and centrifugal forces of planetary orbits. But where is the simultaneous relative equivalency? With an imperfect knowledge of facts we answer thus: The planets are never simultaneously all north of the equatorial plane of the sun, nor all south of it, and hence some of them are under centrifugal forces and some under centripetal. Neither are they all simultaneously in similar orientation as regards the sun, some of them being on the same side of the sun as the earth happens to be, and others on the opposite side. This indicates a planetary spatial equilibrium, and points to a simultaneous relativity of dilating or contracting force of any one planet.

It is evident that relativity can be explained without rupturing the principles of Euclid. It seems that Ein-

stein has attempted to solve a problem which, from the standpoint of the accepted principles of physical science, is insolvable. He had no fundamental hypotheses to tie to.

Conclusions.

Deductions from the hypotheses confirm the principle of Newton's law of gravitation as being one of the most important factors in the production of phenomena within the solar system. Its effectiveness is enhanced by the advantageously relative position assumed by positive as regards negative matter. On the other hand, its direct application is curtailed to one half of the matter of the universe; and it is further curtailed to the limits of each neutralization field, the maximum dimensions of which is a solar system. Furthermore it is a minority law, and its effectiveness depends upon the minimum pressure induced by the relation of all matter and all force to all space. It is entirely eliminated from interstellar space.

The basic principle of Newton's law of gravitation is attraction between positives. The basic principle of chemical affinity, of the magnetic law of "unlikes attract," of "induction fields," of the diffusion of positive matter (exemplified in hydrogen gas), and of the formation of ether molecules, is the strain to neutralize on the part of positive and negative matter at minimum distance and by maximum contact. The diffusion of negative matter and its circumferential placement, and the greater diffusibility of negative electricity relative to positive, rest on the fundamental principle of repulsion between negative units.

The works of such men as Faraday, Ampere, Maxwell, Joule, Helmholtz, J. J. Thomson, Lord Kelvin, Roentgen, etc., essentially precede the formulation of fundamental hypotheses.

The principles of Relativity and Equivalence are applicable to the motions, or kinetic forces, of the universe, according to our deductions from the fundamental hypotheses. We have formulated the following law: *Every motion has a relativity and an equivalency in simultaneous (inductive), in preceding, and in sequential motion.* But this is nothing more or less than elaborating the concept of the Conservation of Energy advanced by many physicists; or the conception of a constant kinetic energy as assuming a perpetual motion within each Cosmic Unit, as expressed in this work (pages 11, 18, 54, 61).

As regards Einstein. He has ably and persistently labored to bring into harmonious relationship scientific conceptions and experienced facts. But what if scientific conceptions are largely untenable: Then he undertakes an impossible task. Can Einstein explain the relativity and equivalence of the orbital motions of the planets, including the observed rotation of the sun, by means of the accepted scientific conceptions of the solar system? Why is Neptune an exception to the rule of the planets' axial rotations having similar directions (page 51)? Scientific conceptions have no answer for these and for many more problems.

A FINAL COMMENTARY.

Over twenty years ago the author on lecturing on electro-therapeutics formulated a theory as to the nature of electricity, and on the basis of this concept he found that he could explain the relative facts. Sequentially he extended the theory to chemistry and physics. More recently he applied himself to the study of astronomy, and found it feasible to explain astronomical facts by

means of what he now considered fundamental hypotheses, which are simply modifications of the original theoretical formulae. Throughout these years he has assiduously applied himself, with sacrifices in various directions, to the development of the hypotheses, and has found all facts and phenomena brought under consideration to be conformable with the deductions therefrom.

The author is aware that his conclusions are at variance, on many subjects, with prevailing scientific opinion, but has confidence that there are scientists who will examine his work without prejudice. If the principles as formulated are scientifically untenable then his efforts absolutely fail. On the other hand if they underlie the physical facts of the universe then it specially behooves scientific teaching bodies to adopt them. The author is convinced that on the basis of the hypotheses as formulated (pages 8 and 213) a generalization of all facts can be effected. He clearly appreciates that his deductive reasoning may err, but the human characteristic thus indicated in no way invalidates the claim that the hypotheses are universally fundamental.

Relative to the subject it may be pointed out that numerous facts are unexplainable by present day scientific research, or if explanations are attempted a number of theories are offered to account for a single phenomenon; whereas in this work a single theory is laid down to account for all phenomena.

We may compare the indefinite character of the ether as presented in scientific works with the distinct and absolutely defined character of this form of matter as formulated in this work.

We may note the numerous uncertainties in accounting for the evolution of solar systems as portrayed in the

text books of today, and make comparison with the perpetual cyclic evolution, based upon the relation of the intrinsic forces of each solar system, as herein defined.

Science has been unable to explain satisfactorily the causal factors in the exclusive fitness of the earth as a planet for the habitation of man. These, and an indefinite number of other problems, can only be solved by referring them to principles of universal application.

In his publications the author has described the polar energies of the earth as building up the south pole, and hollowing out the north. Polar explorers have verified his deductions by finding a mountain at the south, and a sea at the north pole. He is convinced that the force which drives the earth in its orbit can be tapped, and brought under the dominion of man for practical purposes (page 85).

During the last decade science has taken wonderful strides in the uncovering of facts and the application of principles, but it has made no advancement in the direction of a grand generalization of facts and principles. The innumerable theories must be replaced by deductions from principles which are fundamental. We are firmly convinced that we offer formulae of such principles.

A word of warning: Critics should not view this work from the standpoint of concepts adopted by physical science, but from the standpoint as to whether or no the facts of the universe support the hypotheses.

1403 Hyde street,
San Francisco, California, U. S. A.
September 1, 1921.

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